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China Report

SCIENCE AND TECHNOLOGY

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25 APRIL 1986

CHINA REPORT

SCIENCE AND TECHNOLOGY

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NATIONAL DEVELOPMENTS

'SPARK PLAN' TO OFFER ENTERPRISES GUIDANCE, SUPPORT

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 12, 12 Dec 85 p 5

[Article by Ji Cheng [1518 2052]: "What Is the 'Spark Program'?"]

[Text] The "Spark Plan" is a program to organize and mobilize technological strength to offer direct technical guidance and support for the needs of developing small and medium-size enterprises, especially rural enterprises, and for overall rural construction, and to strive, by the end of this century, to ensure that numerous medium-size and small enterprises and vast rural areas in our country are universally equipped with science and technology, to create a situation of a single spark starting a prairie fire, and to accelerate the speed of the four modernizations in our country. The main purpose of this program is, through demonstrations, to popularize the appropriate advanced technologies available within and outside the country, to spur on rural and local economic development by offering technological support, to turn the superiority of local resources into superiority in marketing to develop a pool of common technology which requires less capital, has quick results and a high economic effectiveness, and is able to spread into a wide area, to arm the medium-size and small enterprises and rural enterprises, to grasp a mature technology of great quantity and covering a wide area, and to promote the technological level of the medium-size and small and rural enterprises and the production rate of social labor. The main policy to carry out this program is one in which technological development is based on the demands of the market, with an effort to develop appropriate advanced technology and to accelerate the transformation from technological results into actual productivity. The "spark program" is a focal point of one of the strategies for technology development during the period of the seventh 5-year period of construction.

12909/9365
CSO: 4008/2053

NATIONAL DEVELOPMENTS

HEBEI IMPLEMENTS 'SPARK PLAN'

Tianjin JISHU SHICHANG BAO in Chinese 28 Jan 86 p 1

[Text] The Hebei Provincial Science and Technology Commission has determined the directions by which science and technology can better serve economic construction under the new conditions: the focus will be on small and medium enterprises, town and township enterprises, and on expanding in the countryside, and a vigorous implementation of the "spark plan" and a large scale transfer and dissemination of scientific and technical achievements will be the points of breakthrough. We will develop and apply "short, even, and quick" technologies in a hierarchical manner to accelerate the economic prosperity of Hebei Province.

Recently, the Hebei Provincial Science and Technology Commission gave its opinions on the arrangements and implementation of the "spark plans": first, implement for provinces, prefectures and municipalities, and counties "spark plans" at three levels that make provisions for all the goals. Funds for provincial level projects stand at about 70 percent of science and technology funds; for prefectures and municipalities they are 80 or 90 percent of science and technology expenditures, and science and technology expenditures at the county level will be used entirely for the "spark plan." The second is that, regarding the principle of selection of topics for the "spark plans," full use of the resource advantages of a particular area will be stressed to manifest particular characteristics. We want to select science and technology achievements that have a short turnaround, are quick to produce results, have little investment, have large advantages, and are valuable for dissemination and as models.

According to these principles, arranging for 500 major "short, even, and quick" science and technology projects in 18 areas will be closely taken care of at the provincial, municipal and prefectural, and county levels. It is estimated that after the projects are completed and applied, 300 million yuan in profit and tax revenue will be generated, that 30,000 farmers will be employed in town and township enterprises, and that 200,000 technicians and management personnel will be trained; with the development of these projects, 20 will be set up based on the dominant agricultural special produce resources of dried and fresh fruit products, poultry products, marine products, high quality cotton and by-products, sesame products, high quality wheat, and Chinese herbs, including the commodity production base of extensive processing

of commodities. This will accelerate greater development of the dominant industries that in this province are food products, beverages, spinning and weaving, ceramics, and building materials to develop 300 key products.

The primary means by which to implement the "spark plans" are: restructure funds allocation methods; make available "matching funds"; restructure the ways science research funds are used and improve compensated recovery of science research expenses; retain a portion for prefectural, municipal, and county science and technology commissions; streamline governm nt and delegate authority, manage according to level, and each entity accept its own responsibilities.

12586
CSO: 4008/2073

NATIONAL DEVELOPMENTS

OVERALL 'SPARK PLANS' DISCUSSED FOR HENAN

Zhengzhou HENAN RIBAO in Chinese 16 Feb 86 p 1

[Article by Li Taixing [2621 1132 5281] and Du Shiguo [2629 2514 0948]: "Henan Province Formulates 'Spark Plan'"]

[Text] Authorities from the provincial science and technology commission revealed recently that there are three specific goals for the "spark plan" during the "Seventh 5-year Plan":

Each year 100 advanced demonstration prototypes of value for dissemination will be featured. In this way, during the "Seventh 5-year Plan" we can feature 500 advanced town and township enterprises' demonstration prototypes. If each prototype can bring along 5 town and township enterprises on the average, then a group could be formed having 2,500 enterprises with advanced technical levels. Figuring that every prototype will generate one marketable well known product, by 1990 town and township enterprises in this province can produce 500 products with competitive capacity. Our goal is to increase output value by about 500 million yuan each year. During the "Seventh 5-year Plan," increased output value for the whole province would be striving toward 2.5 billion yuan.

During the period of the "Seventh 5-year Plan" we will develop 30 complete outfits of technical equipment suitable for the countryside, which on the average will mean 5 to 6 per year as well as batch production.

Each year we will train more than 10,000 rural intellectual youth and basic level cadres to allow them to learn one or two useful technologies. During the period of the "Seventh 5-year Plan," we plan to train more than 50,000 people, averaging about 100 people per county per year. After 5 years of effort, the number of intellectual youth and basic level cadres in the countryside throughout the province who have mastered one or two specialist technologies or management skills will have reached 100,000 to 150,000.

In regard to the establishment of demonstration town and township enterprises, during the period of the "Seventh 5-year Plan" these will primarily center on breeding, agricultural by-products, and extensive processing and comprehensive utilization of specialty produce from mountain regions, and will be planned according to arrangements of tasking in 10 areas. They are: raising of

domestic fowl and development of technology for comprehensive utilization; oils from grain and the extensive processing and comprehensive utilization of economic crops; raising and cultivation of aquatic products and development of processing technology; development of processing and utilization equipment for forests and orchards; development and utilization of specialty products and resources from mountainous regions; development and utilization of dominant mining resources; development of new building products; development of production technology for foodstuffs and feeds; development of processing technology for new textile products and wools; and development of biological technologies.

The provincial "spark plan" divides the province and prefectures (cities) into two levels, initially providing the province with about 20 first level projects (including "spark plan" projects provided by the state for the province); about five projects for each prefectural or urban focal point (including provincial level "spark plan" projects management for which has been transferred), some 80 in all. Provincial first level "spark plans" are plans that the provincial party committee or the provincial government authorize the provincial science and technology commission to implement. The small number of "three interrelations and one synthesis" projects (that is, interregional, interdepartmental, and interdisciplinary and broad synthesis) that cannot be handled by offices or bureaus directly affiliated with prefectures (cities), counties, or provinces will be taken on directly by the provincial science and technology committee. Outlays needed for implementation of "spark plans" will be met through adoption of the "matching" form of raising funds, which in principle will be spread among the provincial science and technology commission (or relevant departments), areas (prefectures, cities, and counties), and enterprises according to the "3-3 system."

The provincial science and technology commission has suggested that when spark plan projects are selected, they should be projects that can systematically develop and comprehensively utilize the resources of an area, that can be exported and earn foreign exchange, that can constitute a commodity base for industries, and that can make great contributions to the invigoration of a regional economy.

12586
CSO: 40082074

NATIONAL DEVELOPMENTS

TYPES, VOLUMES OF IMPORTED TECHNOLOGY DISCUSSED

Tianjin JISHU SHICHANG BAO in Chinese 28 Jan 86 p 1

[Article by Qu Chunxin [4234 4783 1800]: "China's Importing of Technology Produced Good Results Last Year"]

[Text] China's importation of technology produced outstanding results in 1985. In all last year, 656 contracts for the importation of technology were approved by the Ministry of Foreign Economic Relations and Trade, which was double that of the previous year; total value of the contracts was 2.96 billion U.S. dollars, which was more than 3 times that of the previous year and exceeded the total 2 billion for the entire first 4 years of the "Sixth 5-year Plan."

Since last year, based on the spirit of the directions of the Central Committee regarding unified responsibility and on the requirements of development of the domestic economy, all relevant departments enhanced their management of the importation of technology on the basis of a large scale survey and study and of regulatory organization. They reduced the number of unnecessary repetitious importations, which allowed the importation of technology to develop even more broadly and deeply. As for the modes of importation, licensing, technical service, advising and consulting, and cooperative production were the most numerous types of contracts.

Last year, China signed 248 contracts with a total of 8 European countries at a value of 1.47 billion U.S. dollars, which was 47.9 percent of the total volume of contracts for the year. A total of 123 of those were contracts signed with West Germany, for a total volume of 790 million U.S. dollars, which surpassed those with the United States and Japan and pushed West Germany from third place in 1984 to first place. Contracts with France and the United States both doubled over 1984, they tripled with Italy, and there was an increase in growth with the countries of Switzerland, Sweden, and Denmark.

This year, in addition to maintaining cooperation with the countries of Germany, the United States, and Japan, we will expand economic and technical relations with other countries. According to statistics, the countries and areas that this year signed contracts with us for the importation of technology expanded from the 21 last year to 26. Cooperation will especially increase and broaden with other countries in Europe, and there will be more

kinds of technology imported, which will include the several areas of metallurgy, aircraft, railroads, posts and telecommunications, building materials, medicines, light industry, and textiles, some of which will include rather valuable amounts and some contracted projects that are highly technical. As for example where we have signed a technical contract with West Germany for the [BAO GANG] 2050 mm hot-rolled band steel plant; we have contracted with the American Douglas Corporation for cooperative production of the MD-82 aircraft, to develop jointly an advanced branch line aircraft and for supplemental trade at a volume nearing 1.5 billion U.S. dollars, which is 50.6 percent of the total volumes of contracts. But from the point of view of the overall volume of projects, the vast majority are for smaller amounts.

12586
CSO: 40082073

NATIONAL DEVELOPMENTS

CHINA DAILY ANNOUNCES FOREIGN AVAILABILITY OF TECHNOLOGY PAPER

HK250419 Beijing CHINA DAILY in English 25 Mar 86 p 2

[Text] TECHNOLOGY MARKET WEEKLY, which was launched 5 years ago in the wake of the technological reform and trade boom in China, is now available to foreign subscribers. Since its inception, it has contributed a great deal to promoting technological exchange and exploiting China's technological market.

The targets of the newspaper are:

--To transfer new technological results from research institutes and universities to enterprises;

--To organize public bidding to help enterprises solve technical problems in production;

--To exchange experience gained in technological reform; and

--To give a helping hand in the import and export of technology.

In the past 5 years, the newspaper, which is published in Chinese, has handled more than 6,000 technological transactions. The newspaper is said to play a bridging role between scientific research and production and is described as "a technological fair that lasts all year round."

TECHNOLOGY MARKET WEEKLY has established connections with science and technology management departments, economic departments and patent agencies in almost all of the country's 29 provinces, municipalities and autonomous regions.

/9604
CSO: 4010/2013

NATIONAL DEVELOPMENTS

TEXT OF REGULATIONS ON TECHNOLOGY IMPORT CONTRACTS PUBLISHED

Shenzhen SHENZHEN TEQU BAO in Chinese 23 Sep 85 p 2

[Regulations approved by the State Council on 26 August, 1985 and issued on 18 September by the Ministry of Foreign Trade: "Regulations on Approving Technology Import Contracts"]

[Text] Article I. The following regulations have been established according to the "Regulations of the People's Republic of China Regarding Technology Import Contracts."

Article II. The following types of technology import contracts must all be submitted to the government for approval via the appropriate procedures no matter what country the supplier comes from, the source of capital, or the methods of payment:

1. Contracts involving the transfer or licensing of industrial property rights or technical knowhow.

2. Technological service contracts, including entrusting foreign enterprises or conducting together with foreign enterprises feasibility studies or engineering design projects; employing foreign geological prospecting or engineering teams to provide technological services; entrusting foreign enterprises to provide technological services regarding enterprise reform, improvements in production skills or product design, quality control and enterprise management. This does not, however, include contracts to employ individual foreigners to hold positions in Chinese enterprises.

3. Production cooperation contracts involving the transfer of industrial property rights and technical knowhow. This does not include the simple assembly of parts or the processing of imported materials or the production of products according to imported samples.

4. Contracts that provide complete sets of equipment such as plant, workshop, or production line and which have as their goal the transfer or licensing of industrial property rights and technical knowhow and the provision of technical services.

5. Contracts for the purchase of machinery, equipment or materials that involve the transfer or licensing of industrial property rights and technical knowhow and that provide for technological services. However, this does not include the simple purchase or rental of machinery, equipment or materials, but merely provides technical materials such as instructions on random operation and maintenance, or general maintenance services.

Article III. These procedures must be followed to gain approval for contracts involving foreign enterprises, joint capital ventures, or joint cooperative ventures within the People's Republic of China in order to import technology from foreign investors or other foreign sources.

For contracts in which foreign investors use industrial property rights or technical knowhow as equity, the application procedures stipulated in the "Regulations for Joint Capital Ventures in the People's Republic of China" should be followed.

Article IV. Technology import contracts are to be reviewed under the following conditions:

1. According to current norms, all contracts involving feasibility study reports or similar reports for projects above quota approved by the State Planning Commission must be reviewed by the Ministry of Foreign Trade.

2. According to current norms, all contracts approved by the relevant State Council departments or bureaus directly subordinate to it, involving feasibility study reports or projects below the quotas for feasibility study reports, are to be reviewed by the Ministry of Foreign Trade or the relevant departments of the State Council and bureaus directly subordinate to it entrusted by the Ministry of Foreign Trade. "Technology Import Contract Licenses" are to be issued by the Ministry of Foreign Trade.

3. All contracts involving feasibility study reports or projects below the quotas for feasibility study reports approved by provinces, autonomous regions, municipalities directly under the control of the central government, special economic zones, open coastal cities with autonomous economic decision making authority are to be reviewed by the relevant foreign trade bureaus (offices, commissions). All contracts approved by cities or counties involving feasibility study reports or similar reports for projects above quota are to be reviewed by foreign trade bureaus (offices, commissions) of the province, autonomous region or municipality directly controlled by the central government to which the city or county belongs.

4. All technology import contracts between foreign enterprises, joint capital ventures, joint cooperation ventures and foreign investors or other foreign sources, with the exception of cases mentioned in Item 2 of Article III, are to be reviewed by the foreign trade bureau (office, commission) of the province, autonomous region, municipality directly under the control of the central government, special economic zone, open coastal city or city with economic decision making autonomy where the enterprise in question is registered.

Article V. The following documents related to the above-mentioned technology import contracts should be sent by the contract's recipient within 30 days of signing to the appropriate agency to be reviewed and approved:

1. Application form;
2. A copy of the contract and a translated version;
3. Documents demonstrating the legal status of both signatories. When necessary, the reviewing agencies may request that the applicants supply other documents and materials needed in the process of review and approval.

Article VI. Upon receiving an application, the reviewing agency should examine the following matters:

1. Whether the contract meets the requirements set forth in the approved feasibility study or similar documents.

2. Whether the provisions of the contract are complete.

3. Whether there are clear, rational regulations in the contract concerning the transfer of property rights over the technology, and responsibility in case of a dispute over said rights.

4. Whether there are rational regulations in the contract concerning the technological level which is to be reached by the transferred technology, including guarantees as to the quality of products produced utilizing the technology in question.

5. Whether prices and means of payment stipulated in the contract are reasonable.

6. Whether regulations in the contract concerning the rights, responsibilities and obligations of all parties are clear, reciprocal and reasonable.

7. Whether there are any promises in the contract concerning preferential tax treatment not approved by China's tax agencies.

8. Whether there are any provisions in the contract that are in violation of China's current laws.

9. Whether there are any provisions in the contract that are harmful to China's sovereignty.

Article VII. Review agencies should complete their review within 60 days of receiving the contract application form:

1. Review agencies should issue a uniform "Certificate of Approval for Technology Import Contracts" as printed by the Ministry of Foreign Trade for all approved contracts.

2. Review agencies should offer an explanation at an early date as to the reasons for refusing approval of a contract, and request that the recipient signatory unit renegotiate with the supplier of the technology, so that alterations can be made which will lead to approval.

In order to facilitate the review and approval process, the recipient negotiating unit can, before or during negotiations, seek the advice of the review agency concerning the main content or certain clauses of the contract, and request a preliminary review.

Article VIII. After receiving governmental approval, review agencies should send a copy of the "Certificate of Approval for Technology Import Contracts" together with the contract and relevant data to the Ministry of Foreign Trade for registration. The Ministry of Foreign Trade will issue a separate announcement concerning specific regulations regarding the reporting of data.

Article IX. When engaging in activities such as applying for bank guarantees, settlement of exchange, making payments, reporting to customs, paying taxes or applying for tax credit as part of the implementation of a technology import contract, the "Certificate of Approval for Technology Import Contracts" or a copy must be shown. If the certificate or a copy is not shown, the bank, Customs or tax bureau has the right to refuse acceptance of any said application.

Article X. If during the execution of the contract, substantial alterations are made in it or in its time limits, a reapplication for review and approval must be made according to these regulations.

Article XI. The Ministry of Foreign Trade is responsible for interpreting these regulations.

Article XII. These regulations shall go into effect on the day they are issued.

12221/12781
CSO: 4006/151

NATIONAL DEVELOPMENTS

PRIORITIES FOR CHEMICAL INDUSTRY RAW MATERIALS DISCUSSED

Beijing RENMIN RIBAO in Chinese 4 Jan 86 p 2

[Article by Zhang Hongwen [1728 1347 2429]: "Give Priority in Raw Materials Allocation to Enterprises That Manufacture Quality Products and Get the Best Results"]

[Text] Tianjin (XINHUA)--This reporter has learned from the National Rubber Industry Conference which recently ended that the Chemical Industry Ministry has decided that from now on production and raw materials allocation in the rubber industry would be based on the product quality and economic returns of each enterprise in order to encourage enterprises to enhance product quality and increase economic results.

It was suggested at the conference that the goal of struggle for China's rubber industry during the Seventh 5-year Plan be to go after famous international brands and to seek to attain and surpass international standards. To realize this goal, the Chemical Industry Ministry will strengthen macroeconomic guidance and professional management over the 100 core enterprises in the rubber industry nationwide. A system of ranking in the rubber industry has already been set, and the relevant departments will appraise and categorize the enterprises according to product quality, balance between production and sales, and economic results. First-category enterprises will receive priority in arranging production and allocating raw materials in short supply; second- and third-category enterprises will find their production limited; raw materials in short supply will no longer be provided enterprises below the third-category level. The ministry also decided to rank rubber products according to quality, according unclear top prices for high quality.

Information provided at the conference shows that production is in good shape in China's rubber industry this year. Production of major products has already surpassed the planned quotas. However a tendency to emphasize quantity and speed at the expense of quality and results has appeared among some enterprises. Relevant persons have pointed out that the implementation of the above decisions of the Chemical Industry Ministry will aid in overcoming these unhealthy tendencies, and will stimulate enterprises to get better economic results and raise technical standards through competition.

12221/12951
CSO: 4006/556

NATIONAL DEVELOPMENTS

SICHUAN DEPARTMENT DIRECTOR SPEAKS AT CHEMICAL INDUSTRY MEETING

HK290649 Chengdu Sichuan Provincial Service in Mandarin 2300 GMT 26 Mar 86

[Text] On 26 March, at the provincial meeting of heads of chemical industry bureaus and factory directors, (Liu Xufu), director of the provincial chemical industry department, made a work report on carrying forward the spirit of the foolish old man who removed the mountains, being united together, and striving to accomplish all assigned targets for the year.

He pointed out in his report: The gross output value of the provincial chemical industry totalled 2.969 billion yuan in 1985, an increase of 6.1 percent compared to the previous year. Profit and tax delivery totalled 467 million yuan. In terms of per capita value, the amount of profit and tax delivery increased by 8 percent compared to the previous year. The industry also accomplished all economic and technological targets assigned by the upper authorities. The quality of products has improved, while the consumption of manpower and financial and energy resources have been reduced.

In 1985, two of the province's products won state gold prizes; three won state silver prizes; 14 won the title of outstanding products of the Ministry of Chemical Industry; and 20 won the title of outstanding products of the province.

This year, the focal point of the province's development of chemical industry is to develop effective compound fertilizer, fine chemical industrial products, and marketable basic chemical industrial products. We should help the township enterprises to develop organic chemical products and processed chemical products.

/8309
CSO: 4008/1051

NATIONAL DEVELOPMENTS

XINHUA CARRIES SCIENCE NEWS BRIEFS

OW271021 Beijing XINHUA in English 0641 GMT 27 Mar 86

[Text] Beijing, 27 Mar (XINHUA)--Scientists at the Institute of Metals Research of the Chinese Academy of Sciences have developed a centrifuge made of nickel-chromium alloy for the production of glass-fiber cotton. The centrifuge can work at a temperature of more than 1,000 degrees centigrade and at 3,000 rpm. Its lifespan is up to 350 hours.

Glass-fiber cotton is an energy-saving sound-absorption material widely used in the metallurgical, petrochemicals, transport, building and aviation industries.

The Changchun Institute of Applied Chemistry of the Chinese Academy of Sciences and the Jiangxi Provincial Rare-Earth Research Institute have come up with a new process to separate mixed rare-earth elements in one step.

By using an extraction agent the process can separate rare-earth elements such as lanthanum, terbium, thulium and lutetium, which are in great demand on world markets.

Experts viewed that new process will contribute greatly to exploiting the country's rich rare-earth resources and increasing the variety of rare-earth products.

Scientists at the Chinese Academy of Sciences have recently developed plasma-etching and reactive ion-etching technology and related equipment.

The etching process uses automatic loading and unloading systems controlled by microprocessors, technology developed only in the early 1980s, and is mainly used for the development of large-scale high-precision integrated circuits.

/9604
CSO: 4010/2013

NATIONAL DEVELOPMENTS

COMPUTER PRODUCTION CAPACITY BOOSTED

HK070925 Beijing CHINA DAILY in English 7 Apr 86 p 2

[Text] The microelectronics industry has witnessed great advances in recent years. It now has the capacity to produce more than 54 million pieces of integrated circuits a year, according to the journal ECONOMIC INFORMATION.

Research on integrated circuits started in 1964. There are now 17 major enterprises in the country engaged in their research and production.

ECONOMIC INFORMATION noted that nearly 900 of the country's integrated circuit products have reached international standards.

Meanwhile, China has also attained an annual capacity of producing more than 300 large, middle, or small-sized computers, the paper said.

The country is also capable of turning out about 100 analog computers and 30,000 micro-computers a year.

The computer manufacturing industry consists of 130 enterprises employing 90,000 people.

The country has also succeeded in making large computers capable of processing 100 million instructions per second. And robots have begun to be applied in China's industries.

Nowadays, ECONOMIC INFORMATION said, computers had not only gone into factories, colleges, and high schools, but also into farms and primary schools. They were playing an increasingly important role in China's economic construction and national defense.

ECONOMIC INFORMATION also highlighted China's development of telecommunications technology by mentioning the country's success in building communications and broadcasting satellites, and satellite ground stations.

It also said China had established nearly 100 optical fibre communications systems.

/8309
CSO: 4010/1038

NATIONAL DEVELOPMENTS

JIANGSU PROVINCE APPLIES COMPUTERS TO INDUSTRY

OW061301 Beijing XINHUA Domestic Service in Chinese 0011 GMT 6 Feb 86

[By correspondent Gao Lihua and reporter Zhang Xingduan]

[Excerpts] Nanjing, 6 Feb (XINHUA)--A "zeal" for popularizing the use of computers has not only promoted technical progress in the industrial department of Jiangsu Province, but has also yielded huge economic benefits. By the end of 1985, computers had been used in some 1,500 projects in the fields of machinery and electrical equipment manufacturing, automatic monitoring and control of industrial production, enterprise management, agriculture, medicine, and office administration.

In the last 2 years, the Nanjing Micromotor Plant and the Changzhou Telecommunications Equipment General Plant have constantly applied microcomputers to new projects. Now, they use microcomputers to control, not only ordinary lathes, but also other machine tools, such as drills, boring machines, grinders, milling machines, and punching machines. The efficiency of the machine tools has been raised 400 to 600 percent.

The light, textile, and chemical industries are applying microcomputers to controlling production process. As a result, they have improved their situation and greatly increased their efficiency.

Scientists and technicians in Jiangsu Province have also applied computers in other economic fields and the people's livelihood, and made the computers work wonders.

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NATIONAL DEVELOPMENTS

SHAANXI HOLDS SYMPOSIUM ON DEVELOPING ELECTRONICS INDUSTRY

HK080636 Xian SHAANXI RIBAO in Chinese 24 Mar 86 p 1

[Report: "Shaanxi Holds Symposium on Strategy for Developing Electronics Industry"]

[Text] On 11 March, the electronics industrial department of the Shaanxi Provincial Government held a symposium on strategic targets, tasks, and measures for the electronics industry in the province. Many experts and professors were invited to the symposium to express their opinions. Provincial party committee secretary Bai Jinian, provincial vice governors Zhang Bin and Sun Kehua, and Zhang Xuedong, vice minister of the electronics industry, also attended and addressed symposium.

The strength of the electronics industry in our province is considerable. Throughout the province there are 63 electronics enterprises, 13 research institutes, and 40 schools which give electronics courses. The number of units associated with the industry totals 116, ranking it first place in the country.

Comrades attending the meeting proposed that the strategic objective for the development of the electronics industry be to realize the "two shifts": to shift the electronics industry to meet the needs of the national economy, modernization construction, and social life; and shift the electronics industry to concentrate on developing computers and communications equipment on the basis of developing microelectronics technologies. They also recommended that the electronics industry change from a closed, scattered pattern to an open, concentrated pattern. During the Seventh Five-Year Plan it is expected that the total output value of the electronics industry will top 3 billion yuan. Some 300 items based on new technologies and product lines will be developed, and exported electronics products will exceed $40 million. By the year 2000, the output value of the electronics industry is expected to reach 8-10 billion yuan. In order to achieve this grand strategic target, the meeting outlined some important measures, including that of building three electronics bases in Xian, Xianyang, and Baoji. This theoretical discussion meeting thus became a meeting which dealt with practical work. Provincial party committee Secretary Bai Jinian praised those comrades who attended the meeting, saying they had set a good example for other industries and departments. He hoped that their plan would be put into practice as soon as possible.

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NATIONAL DEVELOPMENTS

S&T RESTRUCTURING PROGRESS IN 1985 NOTED

Beijing NONGMIN RIBAO in Chinese 14 Feb 86 p 1

[Article by Zhou Zheng [0719 6927]: "Large Number of Achievements Sold to Small and Medium-sized Enterprises and Town and Township Enterprises"]

[Text] We learned on New Year's Eve from the State Science and Technology Commission that after the CPC Central Committee issued its resolution regarding restructuring of the science and technology system preliminary results are being seen from the year-long work in restructuring. There have been advances both in opening up technology markets and in the integration of research with production, and scientists and technicians have begun to move from the cities to county and town and township enterprises.

The technology markets were very active in 1985 and trade activities were largely between research structures and small and medium-sized enterprises and town and township enterprises. At the first national technology achievements trade fair held last year in the capital, activities of this sort were 60 percent of the deals transacted. By the end of the year, the volume of trade conducted at technology markets throughout the nation was 1.77 billion yuan.

More and more research organizations have formed joint bodies or other formats with production units to develop technology jointly, so that by the end of 1985 there were 9,768 joint research and production organizations throughout the country, which was more than a four-fold increase over 1984.

The State Science and Technology Commission feels that the overall trend in the movement of scientists and technicians is a reasonable one. In 1985 the net transfer of personnel from cities to counties and towns and townships was 1,356.

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NATIONAL DEVELOPMENTS

PROBLEMS IN DEVELOPMENT STRATEGY RESEARCH

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 12, Dec 85 pp 4-5

[Article by Mu Suping [4476 4790 1219]: "Problems in Development Strategy Research"]

[Text] In the past 2 years, many provinces and cities, while organizing research on the strategy of economic and social development, also specially organized a troop and appropriated a certain amount of capital to do research on the strategy of scientific and technological development. This has great significance on the effect of fully developing science and technology for economic construction. And it also indicates that many leaders have realized the importance of science and technology on which economic and social development must depend.

At present, the research work of technological development strategy has had a happy beginning and is gradually marching on step by step. Making a comprehensive survey of the history of China and other countries and summarizing the experiences of their successes and the lessons of their failures in the stragey of scientific and technological development, the researchers have drawn this conclusion: to formulate a correct and feasible strategy for scientific and technological development, the key is to solve the problem of harmonized development between science and technology on the one hand and economic and social development on the other.

For example, after World War II, the strategy of "founding the state on technology" was adopted in Japan, and since it fit the situation and economic strength of that country, Japan was able to leap from being an economically weak country to being the second strongest economy in the world. In the fifties, the strategy of "catching up with and surpassing the advanced" was raised in our country in order to catch up with the advanced countries in technology within 10 to 20 years. Since it did not fit the situation in our country at that time, only "catching up and surpassing" were attended to, while the technological problems of production were neglected, which resulted in the waste of any human, material, and economic resources, the detachment of technology from the reality of production, and the hindrance of economic construction.

The facts in the past have proved that harmonized development between technology and economic and social development is an objective law which we must observe. If any country, province, or district violates this law, its goal of development will never be attained nor will it last even if attained. The reason is that the development of contemporary science and technology has become an important factor in economic and social development and the development of science and technology must have a powerful economy to back it. Besides, scientific and technological activities are becoming institutionalized with the unprecedented socialist development. Thus the relationship of interdependency and mutual conditioning among the three has been established. This will not be changed by people's decisions. We must recognize and observe it. In research on a strategy for scientific and technological development, we must combine science and technology with economics, and combine natural science with social science, to understand and probe this law further.

In the past 10 years, research on the strategy for combined development in science and technology and in economic and social development among nations has become the biggest concern. Its importance is recognized by more and more people in our country. After the 3d Plenum of the 11th CPC Central Committee, the history of our country made a new turn, and the party Central Committee and the State Council in time advanced the strategic policy that "science and technology must be geared to economic construction and economic construction must depend on science and technology." Both the "gearing to" and the "depending on" reflect the fact that technological and economic development must be in harmony.

Based on a harmonized development strategy policy, under the situation of facing the challenge of the world's new technological revolution, and on a comprehensive analysis of technological and economic capabilities and natural and social conditions, we cannot imitate the developed countries by first passing through the stage of traditional industrial development and then progressing to the stage of newly developed industry. Thus the difference will become greater, and we cannot catch up and surpass the developed countries totally and in as short a period as possible. We cannot start everything over again through self-reliance, nor can we even discriminate against the function of foreign advanced technology. Instead, we must adapt a comprehensive strategy with a multifaceted pattern. To fit the strategy, the technological structure should be pluralistic, that is, there should be coexistence among the most advanced, advanced, less advanced, and handicraft labor. We must adopt a new technology which is used for new developments in foreign countries and which fits our needs. We must consider both the basic function of the traditional industry and the leading role of highly developed new industry, to combine advanced technology closely with the economic construction of our country. This is the overall ideology of the strategy of scientific and technological development with Chinese characteristics.

However, how to realize this overall ideology in the research of local science and technology development is an important topic for research in our scientific and technological strategy. We do not have a mature experience yet in how to realize the harmonized development among the three; yet, based on our understanding, the following points should be noted:

First, a systematic point of view and a systematic engineering method must be used to proceed with scientific design work. Under the guidance of united thought, start with the overall situation to study the best target system for the harmonized development of the three. The scientific and technological development strategy should take the requirement of economic and social development for science and technology as its strategic goal, the adjustment of the industrial structure, the technological innovation of the enterprise, and the development of new industry as focal points and organically connect the strategy of scientific and technological development with economic and social development. We must change our past incorrect way of studying science and technology in isolation and even of collecting all the research items together and taking them as a technological program and strategy. We must go deep to study the specific requirements of science and technology in the realization of the strategic goals of economic and social development, to study how these requirements can meet the demands of the overall goal to recognize fully the social function of science and technology, and to probe the optimum structure for the harmonized development of the three, in order to make the three able to face development in the midst of dependency, promotion, and conditioning to realize the overall goal.

Next, we must study to understand fully the local situation to choose the mode of strategy for science and technology development, which will fit the characteristics of a specific province and district. The concrete situations of different provinces and different places are different, and we cannot just copy or indiscriminately imitate any mode from a foreign country or another place and we cannot all walk on the same road. We must do further studies on the superiority and inferiority of our province, or of any place, on ways to use science and technology to give full play to the superiority and to overcome the inferiority, in order to know which are the technologies which are urgently needed for local economic construction and which also have great economic effects. Based on these, we can put forward the pattern of the strategy for science and technology development in the local area. For example, wool is a rich resource in Qinghai Province; they can choose their strategic pattern with wool processing as the focal point in the exchange of resources and adopt such advanced technologies as breeding, shearing, and processing in order to raise the quality and quantity of the wool product, to capture markets within and outside the country, to create good economic results with which to spur on the production of other related products, and to give full play to the superiority of the resource.

Then, we must formulate concrete measures to guarantee the harmonized development of the three. In the study of our technology development strategy, we must put forward concrete measures to guarantee the realization of the strategic goal for economic and social development and determine whether they emphasize the harmonized development of the three as an important standard to evaluate the accuracy and feasibility of the strategy. And we must put forward from our organization some measures to guarantee their implementation, such as harmonizing the work of planning, harmonizing the economic and technological committees in the work of strategy development, programming and

planning, etc. In organizing the different levels to develop the strategy study ranks, we must pay attention to the presence of both the leading cadres and the management cadres and the presence of both natural scientists and social scientists. We must also create situations to enable the wide participation of scientists and technologists in activities to make decisions about economic and social developments and to raise the level of strategy study and decision making.

Whether we can formulate a strategy for harmonized science and technology and economic and social developments, and whether that strategy is able to realize the key points of that strategic goal, we must combine theory with reality to probe and lead seriously the study of strategy for scientific and technological development a step further.

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NATIONAL DEVELOPMENTS

DIFFERENT APPROACHES TO S&T DEVELOPMENT DISCUSSED

Jinan DAZHONG RIBAO in Chinese 5 Feb 86 p 4

[Article: "A Few Thoughts on Domestic Technology Transfer"]

[Text] Recently, some specialists have made a few suggestions on how to undertake technology transfer between regions in this country that differ economically and technologically, which have generated some contention.

1. Evolve in Gradient Stages

Advocates that in the process of carrying out the process of the open door policy the coastal economically and technically advanced regions would be first to master advanced world technologies, after which they would shift gradually inland and toward the frontiers along "central technology" belts and "traditional technology" belts in steps of economic and technical capacities that are formed naturally. This approach considers that in this way expenses would be lesser and profits greater.

2. Evolve in Leaps

Believes that the basic alignment for modern science and technology, in addition to transferring toward regions with abundant intellectual resources and rather high levels of technology, is also shifting toward areas of abundant natural resources and areas of advanced trade. The latter two transfers would be mostly transfers of an leaping forward type. As China's economy develops and we continue to implement an open-door policy, undeveloped areas should import large amounts of foreign advanced technology on the basis of their natural resource advantages, which would allow their own economies and technologies to generate a surpassing development, and ought not only accept relatively backward technology transferred from first and second stage areas within the country. Some even feel that in order to use opportunities from the new technical revolution and to accelerate China's economic advancement, China's strategies for technology transfer ought to be from the leaping forward model.

3. Forward and Reverse Gradient Transfers

It is felt that with an evolution in stages there will be a counter evolution in stages, that is, that after some areas of backward economies and technologies have imported advanced technology, and after effective absorption, assimilation, and innovation, the advanced technology will then be transferred to the developed areas. The combination of counter evolution in stages and evolution in stages constitutes forward and reverse gradient transfers. China should adopt this strategy.

4. Varied Transfers

That is, according to the differing needs of the nature of a technology and conditions for development, adopt the gradient, inverse gradient, and leaping forward type of transfers separately. The reasoning here is that with different technologies the conditions for development are also different: some need abundant natural resources and some need mature intellectual resources; some need a higher base of existing economy and technology, while others need less. In theory, evolution in stages denies the possibility of undeveloped areas to develop past their beginnings, and thus is a metaphysical concept in which a state of uneven development of economies and technologies is considered unchanging. We can see from the history of the development of world economies and technologies that because the requirements for the conditions of development for rising new technologies were not the same, different economic and technical regions could import and develop certain new technologies based on their own superior conditions, which enabled the economy and technology of the area to develop in leaps and bounds. If only the evolution in gradient stages is adopted, then the tendency will be to bring on the following unfortunate consequences: 1. We cannot ensure that imported technology will always be smoothly absorbed and assimilated. This is because our advanced industrial system is not solely distributed within the first stage area. The natural resources in the first stage area are seldom as good as in other stages. 2. If advanced technologies are all shifted after importation into the first stage area, this will lead to the first stage area not having any character, which will not benefit making the most of a place or its advantages. 3. This will expand the economic and technical gaps between undeveloped areas and developed areas, which is of no use to the even development of the Chinese society and economy. The leap forward type of evolution also has metaphysical contradictions in theory. Because although undeveloped areas have natural resource advantages and certain professions and areas can use the newest technologies to developed unprecedentally, especially in aspects of resource exploitation, they cannot develop unprecedentally in all aspects, especially those new technologies and new industries that have a close connection with the existing industrial base. For if we depart from a certain base, there cannot be good development.

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NATIONAL DEVELOPMENTS

COMMENTARY ON S&T FUNDS ALLOCATION REFORMS

Beijing GUANGMING RIBAO in Chinese 5 Feb 86 p 1

[Text] The provisional resolution of the State Council regarding management of funds allotment for science and technology is a major restructuring of current management of allotments for science and technology. Implementing this resolution will make management of our science research more scientific and the use of science and technology allotments more reasonable, which consequently will benefit the development of China's science and technology.

For a long time now science and technology in China has neither respected nor been good at using economical means, but has solely relied on administrative management, topics have been handed down from above, and expenses have been used without compensation by each unit, all of which has made certain units dependent upon higher authorities, they have lacked motivation to face economic forces, and they have lacked the capacity to arm themselves and to develop on their own. In another sense, adopting "arbitrary uniformity," typical administrative management methods for different kinds of scientific and technical activities would not be suited to the characteristics and rules of scientific and technical activities themselves.

Restructuring the management methods for science and technology allotment and implementing management of outlay categories for different types of scientific and technical activities, such as with a bidding system for major national science and technology projects, implementing a technical contract system for technology development and for applications research work from which practical value can be expected in the near term, implementing a science fund system for basic research and for applications research for which practical value cannot be obtained in the near term, implementing an outlay responsibility system for research having social value and for work in technical basics, etc., will closely link outlay with tasking and will make use of funds more reasonable and effective. Through the various channels of applying for funds, bidding on projects, developing lateral relations, and signing technical contracts, research units will garner even more funding sources. However, the obtaining of these funds will not be as comfortable as it was in the past, nor as easy to initiate, nor as easy to guarantee results from nothing. Rather, they will

have to get involved in competition relying on their true abilities. This will mean that research units must constantly be increasing their own strengths, improving their own standards, and creating their own characteristics before they will be able to be successful in competition.

Restructuring allocation management methods for science and technology is a component and key presence in the restructuring of China's science and technology system, and brings a great deal of pressure to scientific research units. However, as long as we improve our knowledge, maintain the reforms, be practical and realistic, and plan comprehensively, that pressure will become a driving force, and it will more quickly put a prosperous new face on science research.

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NATIONAL DEVELOPMENTS

GRANTING, MANAGEMENT OF S&T DEVELOPMENT FUNDS DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 12, 12 Dec 85 pp 35-36

[Article by Wang Huanying [3769 3562 3841]: "Granting and Management of S&T Development Funds"; continuation of article "Outline on Establishing a Science Development Bank" published in issue No 5, 1985]

[Text] 1. Basic principles of loans. The granting and use of the loan must be done according to the plan and the loan must have a profit enterprise as guarantee (or bond or real estate) and must be repaid on schedule.

2. Limits on loans. Any unit engaged in scientific research, productive enterprises, or scientific research, or joint enterprise entities engaged in technological development which has practical value in its application within a short period of time, in intermediate testing approved by the state government, in the importation of foreign advanced technological equipment, in the trial production of new products, and in production tests and programs to solve a series of technological problems in industrial production such as the quality, reliability, lower cost, and rate of a finished product or required equipment and material, if they have insufficient capital, may apply to the development bank for a loan, especially those which have technological strength, good credit, abundant achievements in research, and strong financial power. The bank should give them priority in loans and an appropriate preferential rate of interest according to the interest policy of the state.

3. Conditions for loans. Any scientific research organization, productive enterprise, or combined research and production entity applying for a development loan must open an account in the bank to establish an individual scientific development fund account with a specific amount of private capital. Both the funds appropriated by the state and the funds privately raised for scientific research must be deposited in that account and the spending of that money must be under the supervision of the bank. On the application for a scientific development loan, the topic of research or the item of technological development must be one approved by the legal authorities or recommended by related experts or technical personnel. The creditor should provide the necessary explanation and description of the development to the bank. In case the bank has a different opinion about the technical or

economic feasibility of the development topic applied for, the bank may ask other scientific research units to reevaluate it and if the reevaluation deems it to be indeed feasible the bank will then grant the loan and the fees for the reevaluation should be paid by the creditor.

4. Procedure for loans. In granting scientific development loans, the two parties must sign a contract which must be notarized by a notary public. The two parties must observe the "Regulations on Loan Contracts" issued by the State Council and effected on 1 April of this year, strictly observe the articles of the contract, and fulfill the obligations specified in the contract.

5. Terms. The terms of scientific development loans should be, in general, 1-3 years, and in special cases, it can be extended according to the practical situation; however, the maximum should be no longer than 5-7 years. When the term is too long, it is a disadvantage, on the one hand, for the bank in its management of the loan and, on the other hand, a disadvantage in terms of the best use of the loan.

6. Interest. The interest rate for the scientific development loan is based on the policy on loan interest designated by the state at different times to determine its base interest and the floating interest rate.

7. Control of loans. After the S&T development loan is granted, the bank should enforce its control and establish a loan file according to the topic of research or the item of technical development, and it should make sure that the bank personnel penetrate into the unit of the credit recipient to understand the progress of the research and how the funds are used. The loan must be used for its specific purpose and repaid on schedule. If the loan is improperly used, or if it is not repaid on schedule, the bank should add a penalty according to the regulations.

8. Source of repayment. The "Decision of the Central Government of the Communist Party About the Reform of the System of Science and Technology" points out that "all short-term income taxes from the result of technology transfer will be exempted, and new products may enjoy, for a certain period of time, a favorable tax reduction. Units with technological results may be joint owners of an enterprise by taking the technology as shares." The state passed the patent law and relevant regulations to provide legal protection for the property of knowledge. Thus, the main source of repayment of the loan will be the payable transfer fees of the technology result (patent income), the share of the profit from the joint entity of the production enterprise, S&T research unit, or the S&T production management unit, and the newly added profit from the new product and tax exemption or reduction. The income mentioned above from the joint entity of the production enterprise, the S&T research unit, or the S&T research production management unit, except, according to the regulation, a part which will be used to reward personnel directly involved in research work, should first be used to repay the loan.

9. The bank raises funds and shares the risks of the loan. A scientific and technological development loan is a loan of investment, especially for those with a great future, a great amount of capital, and a high risk; we can consult the method used by the Japanese banks in support of "Silicon Island" (a joint entity of technology research, education, and production management); let the bank issue bonds or stocks for the S&T research unit or the joint entity of technology and production management; and guide the departments, enterprises, and social groups to invest in science and technology. The bank will charge a small service charge, or we can let the ban directly join the risk capital company composed of the S&T research unit and insurance companies, etc., and the bank will purchase stock by way of granting a loan to share both the risk and the profit. Thus the economic responsibility of the bank in granting technological development funds will be strengthened. Business income will also be increased and the strength of the bank will be strengthened.

10. Loan sanctions. A loan sanction is a necessary measure to realize the supervision of the loan. If any unit or enterprise violates the credit system, diverts the loan, or does not pay it back on schedule, the bank may, according to the situation, take the necessary measures for a credit sanction, such as raising the interest rate, enforce the recouping of the capital and interest of the overdue loan, call in an improperly used loan before the end of its term, stop part or all of the loan, or take other measures. In general, the purpose of taking these measures is to force the unit or individual to improve management and observe the economic and financial rules of the state. When the management of the unit or the individual has been improved, the sanction should be withdrawn and the normal credit relationship should be restored.

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NATIONAL DEVELOPMENTS

SOME RECENT S&T ACHIEVEMENTS DESCRIBED

Shanghai JIEFANG RIBAO in Chinese 28 Jan 86 p 1

[Text] By the end of last year, 58 projects had been completed in a group of targeted key tasks, both national and for Shanghai Municipality, that were the responsibility of various research institutes affiliated with the Shanghai branch of the Chinese Academy of Sciences during the period of the "Sixth 5-year Plan." That was nearly one-third of the total number of research achievements for that year.

Among those key projects completed by the Shanghai branch academy during the "Sixth 5-year Plan," some were from rising new industries like microelectronics, new materials, and bioengineering, and were of a rather high scientific and technical standard. The two microelectronics technology key tasks finished by the Shanghai Metallurgical Institute concerning the "4K bit CMOS static RAM" as directed by the Office of Electronics Promotion of the State Council is the most highly integrated CMOS technology yet achieved domestically, and made some key breakthroughs in technique, which will vigorously promote the nationalization of IC production for China's computers, high speed communications, and various electronic technologies. The Shanghai Silicate Institute and the Organic Chemistry Institute have successfully developed spacecraft inorganic and organic temperature control coatings, respectively, which is a big contribution toward putting China's communications satellites into space. In bioengineering, following on successful research by the Shanghai Institute of Biochemistry into a genetically engineered vaccine for type B hepatitus as directed by the State Science and Technology Commission, after it entered clinics and was tested, the Shanghai Institute of Genetics made great breakthroughs in research for cloning antibodies for human liver cancer cells. In addition to this, there was a series of important achievements in key tasking for fiber optic communications, laser processing, and remote sensing technology, as well as irradiation technology.

Some key achievements have produced rather significant social results. "Drinking Water and Health" is an important topic in this city, so the Shanghai Organic Chemistry Institute and Entomology Institute investigated the upper reaches and sources of the Huangpu Jiang and many chlorodibenzines (an organic pollutant) in tap water, and monitored these poisonous objects that destroy the quality of water, and then disseminated applications for use with

tap water. In the aspect of research into family planning drugs, manufacture and dissemination of the Chinese traditional medicinal herb for preventing early pregnancies, Chinese trichosanthes, has reached a new stage, and preparations are ready for its production, which can be used to a great degree in clinics. Many biology institutes of the Chinese Academy of Sciences are still developing anti-tumor medicinal herbs, and in the areas of controlling environmental pollution have done work with outstanding results. During the "Sixth 5-year Plan," institutes of the Shanghai branch of the Chinese Academy of Sciences made some important achievements in basic research. "The Structure and Regulation of Nitrogen-fixing Genes" is a topic of far reaching significance to the growth of plants, and the Shanghai Institute of Plant Biology has made major breakthroughs after years of work, and the relevant working group has been recognized abroad by like professions as one of the international research centers for nitrogen fixing genetics.

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NATIONAL DEVELOPMENTS

BIG GROWTH FOR SCIENTIFIC CONSULTATION

OW021246 Beijing XINHUA in English 1214 GMT 2 Apr 86

[Text] Beijing, 2 Apr (XINHUA)--Chinese scientists and specialists are providing more and more consultations to industrial enterprises and government leadership.

According to a report at an ongoing working conference of the China Association for Science and Technology, last year these consultants signed contracts worth 380 million yuan in Shanghai, Tianjin, Liaoning, Sichuan and Shaanxi to provide counselling to 47,000 projects. The expected economic benefits from the consultation may reach 3.5 billion yuan.

The China Association for Science and Technology, which has 138 branches and 1.5 million members, provides most of the consultation on science, technology and management. They also provide research papers to government decision makers.

The Ministry of Metallurgy invited a group of experts to work on the ministry's long-range development plan, personnel training, and problems on the technological renovation and introduction, personal training. Over 5,000 suggestions were proposed and most of them were put into practice.

Scientific consultation in the past 2 years in Sichuan Province turned 235 losing factories into profitable ones and benefited 7,716 others.

Shanghai scientists offered consultation to 26 other provinces. One 15-year-old Hunan bike factory was losing money for 11 years. But the year the Shanghai experts arrived, they turned in 6 million yuan to the government.

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NATIONAL DEVELOPMENTS

SCIENCE AND TECHNOLOGY ACHIEVEMENTS IN BEIJING DESCRIBED

Beijing BEIJING KEJIBAO in Chinese 5 Feb 86 p 1

[Text] Restructuring made 1985 a bumper year for science and technology in Beijing. Last year, 2,400 research topics were completed throughout the city, which made it the best year in history for the number of achievements and for the best economic results.

Eighty municipally-affiliated and independent science research organizations in Beijing Municipality at the beginning of last year began full scale compliance with restructuring. Many research institutes affiliated with districts, counties, and companies are also practicing responsibility systems and technical contract systems. Practice has shown that the restructuring has strengthened the vigor of research institutes when catering to the economy. It has aroused the enthusiasm of the majority of scientists and technicians and quickened the pace at which scientific and technical achievements are transformed into production forces. According to statistics from the Beijing Municipal Science and Technology Commission, research organizations at all levels throughout the city last year took charge of 6,000 research topics, and the majority of applications results from them have been good. After achievements from only 1,800 projects had been disseminated, a net profit of more than 200 million yuan was realized. Among the research projects begun by the Beijing Academy of Chemical Engineering last year, 80 percent were topics urgently needed for production. The BT engineering plastic developed by them added a one-ton level key product to the Municipal Chemical Engineering General Company. In the past 24 years of the Beijing Farm Machinery Institute only some 60 scientific or technical achievements were ever completed, but last year after instituting the contractual responsibility system, more than 30 achievements were accomplished, which resulted in gains of more than 400,000 yuan.

Restructuring has brought closer the relation of research to production. Currently, research academies and institutes in Beijing have joined with industries and enterprises to set up more than 500 research and production joint bodies of different formats that transcend districts and professions.

In research to use computers to manage the city, research units in Beijing have cooperated with production units to make rapid progress. At present, 13 intersections on Qian Sanmen Avenue are using microprocessors to control traffic.; 3 bank branch offices and 5 savings institutions are using computerized savings and withdrawl.

Through the restructuring, Beijing has hastened its assimilation and absorption of and outfitting with imported technology. Beijing monochrome television sets have been supplied with 3 IC chips that last year reached a production capacity of 300,000 sets in annual production, which saves a great deal of foreign exchange. The Beijing Dongfang Chemical Engineering Plant Research Institute stepped up their work on the application and development of an imported acrylic ester production facility, from which they have already produced more than 10 new products. Eight new products have gone into large scale production. After application in the capital building, chemical engineering, and paper manufacturing professions, they will have gained outstanding results.

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NATIONAL DEVELOPMENTS

ACADEMY OF SCIENCES DISCUSSES FUTURE PLANS

Beijing BEIJING KEJIBAO in Chinese 5 Feb 86 p 1

[Text] "We must persist in the direction of restructuring, and must put restructuring into the primary position for all work, using restructuring to promote the self-reliance of science and technology and of the science academies." Academy Director Lu Jiaxi spoke these words at the recently held working conference of the Chinese Academy of Sciences in a work report that discussed the primary mission of the Chinese Academy of Sciences during the "Seventh 5-year Plan."

Academy Director Lu Jiaxi pointed out that the deployment of work at the Academy of Sciences would place responsibility for key problems in national science and technology into a primary position to ensure the completion of key problem tasking during the "Seventh 5-year Plan." The Academy will treat science and technology problems that affect national economic construction as the central field of battle in which the Academy of Sciences will serve economic construction. In the aspects of information, biology, energy, and the ecological environment it will arrange for scientists and technicians to tackle key questions, and at the same time it will pay close attention to hastening the transformation of key achievements into industrial production capacities as quickly as possible.

He said that the Academy will earnestly enhance basic research and work of a basic nature to lay a foundation as quickly as possible for the improvement of China's standards of science. With the goal to be in the front ranks of international science and technology, the Academy will progressively adjust its topics, will focus on strengthening the integration of mathematics, chemistry, and the technical sciences with biology, and will carry out research on major theoretical questions such as the working principles of the human mind, the functions of nitrogen fixation, and the structure and functions of biological macromolecules.

He said that work in development will proceed from the requirements of the marketplace with the goals of creating social results and economic results. The Academy will give full attention to the dissemination and application of

major research achievements, and will look closely at development of high technology products, as for example neodynium-iron-boron permanent magnet alloys, various amino acids and zymins, and semiconductor lasers to replace imported ones and enter the international market.

Director Lu Jiaxi also pointed out that the Academy will also promote integration within the institutes and academies and strengthen relations and cooperation both here and abroad. In some important research fields it will alter the situation in which there is repetitious research, will seek unified leadership, will continue to expand international cooperation, and will try to jointly run research laboratories together with foreign specialists.

Finally, he said that the Academy will greatly strengthen construction among the ranks of scientists and technicians, will allow their structures to become more reasonable, and will try hard to set up regular mechanisms for the renewal of contingents and for people of talent to come forth in large numbers. It will expand the number of graduate students admitted to schools, and will shift it's focus to the training of Ph D's.

This occasion of the working conference of the Chinese Academy of Sciences was held in the auditorium of the Beijing Science Association on 26 January. This working conference concentrated on summing up the beneficial experiences regarding restructuring of the science and technology system at the Academy of Sciences during the "Sixth 5-year Plan," and clarified the strategic focus of the Chinese Academy of Sciences during the "Seventh 5-year Plan."

12586
CSO: 4008/2074

NATIONAL DEVELOPMENTS

5-YEAR PLAN SCIENCE, TECHNOLOGY TASKS NOTED

OW040909 Beijing XINHUA in English 0837 GMT 4 Apr 86

[Text] Beijing, 4 Apr (XINHUA)--China will concentrate its scientific forces on tackling 76 key scientific and technological tasks in the 1986-90 period, double the number undertaken in the previous 5 years, a Chinese official said here today.

According to him, 30 percent of the funds earmarked for civilian scientific and technological projects will go to these items. They break down to 34 projects of key technology and equipment, 16 new products, 11 items of new technology, and 15 social development projects. There are 349 specific items, he said, and around 4,000 contracts are expected to be signed.

Over the next 5 years, China will target micro-electronic communication, bio-engineering technology, new materials, laser, remote sensing and robot technology.

Efforts to develop new products will focus on highly efficient insecticides, phosphorous and potash fertilizers, high and medium-grade lubricants, and lake salt products.

Items in social development include research into tumors, liver disease, cardiovascular and endemic diseases, traditional Chinese medicine, birth control, eugenics and environmental protection and treatment.

Major technology and equipment to be developed covers 600,000 kw thermal generators, ultra-high-voltage power transmission equipment, and strip mining equipment with an annual capacity of over 10 million tons.

In agriculture, focus will be laid on seed selection, prevention and cure of plant diseases and pests, feeder development, and breeding and processing of livestock and aquatic products.

According to officials here, China will mount about 100 pilot schemes in the next 5 years so that scientific and technological discoveries can be quickly applied to production. Officials said that 50 national laboratories will be added to promote scientific research in the areas of gene engineering, enzyme engineering, crystal materials, software engineering, micro-circulation, cancer gene and veterinary biotechnology.

/9604
CSO: 4010/2013

NATIONAL DEVELOPMENTS

TASKS OF GEOLOGICAL SCIENTIFIC WORK IN SEVENTH 5-YEAR PLAN

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 1, 13 Jan 86 pp 3-4, 2

[Article by Xia Guozhi [1115 0948 3112] [vice minister, Ministry of Geology and Mineral Resources]: "The Situation and Tasks of Geological Scientific and Technical Work During the Seventh 5-Year Plan"]

[Text] Under guidance by the lines and principles since the 3d Plenum of the 11th CPC Central Committee, S&T work in mineral resource departments during the Sixth 5-Year Plan has adhered conscientiously to the principle of a focus on geology and mineral exploration, and they have completed a great deal of work to guarantee the completion of the goals of geological work during the 5-year plan and to develop geological science and technology. They have attacked key S&T topics, extension of results, application and development of computer technologies, laboratory construction, technical imports and foreign cooperation, organizational restructuring, reforms, and other key tasks. Important advances have been made in many aspects of geological S&T work and major changes have occurred in geological S&T work. They have provided theories, methods, technologies, and facilities for mineral resource geology and other areas of geological work. China has joined the front ranks of the world and approached or achieved advanced international levels in some aspects of science and technology. Overall, however, we still remain far behind advanced world levels, the main ones being: the breadth, depth and degree of comprehensiveness of regional geological research in many areas remain low. Many geological personnel have not improved their understanding of geological theories and few of them have done an intensive summarization of geological theories that are particularly Chinese or have imported and absorbed new modern geological concepts and theories. Many methods, technologies, instruments, and equipment are rather backward and no progress has been made in methods and technologies for solving certain important geological questions, and work has not gotten underway in some major new spheres. Levels of mineral resource and water resource development, utilization and protection are low. Technical economic research concerning geology has just begun, and so on. We also should note that the crashing waves of the new world technological revolution inevitably will have profound effects on the development of geological S&T work. If we fail to adopt correct countermeasures to deal with this severe challenge, the distance between China and world levels will become even wider.

To permit gradual achievement of the strategic goals proposed at the 12th CPC Central Committee and adapt to the needs for development of the national economy, the CPC Congress passed the proposals of the CPC Central Committee concerning the formulation of the Seventh 5-Year Plan for development of the national economy and society and issued glorious yet arduous tasks in many aspects of geological work. A large number of new topics have been proposed for geological work during the Seventh 5-Year Plan. Basic geological work will be reinforced (including medium- and large-scale surveys, regional geochemical prospecting surface scans, regional geophysical prospecting, second-generation aerial geophysical prospecting, remote sensing geology, deep strata geology and geophysical surveys, regional hydrogeology, engineering geology, environmental geology and so on). Oil and gas geology tasks will require a new expanded round of solid mineral surveys that now are developing and urban geological work continues to make intensive developments. Geological work in western China gradually must be reinforced and significant progress should be made in technical transformation of all geological contingents. Mines operated by the masses and geology markets now are growing and continued developments will be achieved in environmental geology, marine geology and other fields. As the work becomes more intensive, geological work will face a situation of increasing difficulty in mineral exploration and ever more intense competition. In this situation, improvement of the speed and quality of geological work and improvement of the economic and social benefits of geological achievements must depend on modernization in geological work, and the key is modernization of science and technology. For this reason, we must achieve greater adherence to the principle that geological mineral exploration must depend on scientific progress and that S&T work must be oriented toward geological mineral exploration and economic construction. We must integrate closely with the needs of key state projects and mineral exploration in economic construction zones and important mineralization zones and expand the scope of S&T work, open up technical markets and integrate scientific research with technical transformation and technical imports. While striving to strengthen applied and developmental research, we should develop basic research in a stable manner, make unified arrangements for both, focus on key issues and concentrate forces to solve some of the most influential comprehensive geological S&T problems. These include providing geological theories for mineralization forecasts for certain minerals and guiding regional surveys and exploration, supplying advanced and appropriate methods, technologies and equipment for geological surveys and comprehensive utilization to achieve a preliminary conclusion to technical transformation of the entire geological contingent, to establish and outfit a group of scientific research centers and technical development centers at advanced levels and perfect the deployment of S&T work, to set up experimental testing systems in geological and mineral resources departments, to begin establishing new geological data, publication and information centers, to extend and apply electronic computer technologies throughout the range of work, to develop and improve geological S&T staffs and strive to train talented young and middle-aged geologists and skilled managers and create a group of top-rate S&T specialists, and to achieve further development of international cooperation and exchanges, and develop new open-door structures with foreign countries. Through the work described above, geological S&T in China will reduce the differential from

advanced international levels in some spheres of geology and strive to reach current advanced levels in certain realms, and it gradually will strive to make progress in establishing geological theory systems, method and technical systems, and management systems.

We should focus on the following points in S&T development strategies to adapt to the demands of new situations and tasks:

1. Strive to develop and popularize S&T achievements that provide good and rapid results. Take action to adopt new methods, technologies and equipment, and transform geological teams and factories. Accelerate the transfer and dispersal of new S&T achievements within China and raise the S&T levels of geological staffs as quickly as possible.

2. Focus on strategic issues, concentrate superior forces, and organize key attacks to achieve new important S&T achievements. The key questions here are research on methods and technologies concerning oil and gas geology theories in certain regions and spheres, research on geological theories and methods concerning exploration for concealed deposits in eastern China, mineralization in certain key prospective mineralization zones, research on hydrogeology, engineering geology and environmental geology in important economic development zones, and research on comprehensive utilization of economically-important mineral resourses that are difficult to smelt selectively.

3. Actively develop emerging mineral technologies and focus on development of electronic computer technologies, remote sensing technologies, non-seismic oil and gas exploration methods and technologies, mineral exploration engineering, geophysical prospecting, geochemical prospecting, experimental testing, surveying, and other new emerging technologies in other fields.

4. Achieve more effective integration of Chinese S&T research with imports of advanced technologies and accelerate digestion, absorption, and new uses of imported technologies. The focus at present is digestion, absorption, and new uses of recently imported oil and gas exploration technologies and equipment, large-scale precision testing equipment, and geophysical equipment.

5. Strengthen technical economics research in geology. The main thing at present is to integrate closely with reforms in geological work, integrate with modernization of geological management and technical economic analysis and evaluation of mineral resources, and develop research of major significance.

6. Strengthen basic research and long-term applied research like lithosphere research, deep-sea survey research, polar surveys and so on, according to needs and possibilities to prepare an even better S&T reserve needed for future developments.

To achieve these development strategies and complete key tasks, we must focus on two key measures. One is that all S&T management departments at all levels, research organizations, institutions of higher education, computing center, experimental testing centers, and S&T information units should make

full use of existing S&T achievements, new technologies and equipment, knowledge and information, and skilled S&T personnel to provide active assistance in technical progress for vast geological teams, laboratories, and factories. All geology staffs and factories should focus on improvement of the results of geological mineral exploration, product quality and economic and social results to take full heed of and actively mobilize the vast number of employees to develop technical innovation activities. During the Seventh 5-Year Plan, ministry, bureau, team (and factory) capital raising should be employed to focus closely on a group of projects with short development schedules and rather quick results. The second key measure is to achieve true integration of forces in scientific research units, educational institutions, and geology teams (and factories) to concentrate finances and materials for conscientious development of attacks on key S&T questions and solve key topics that require urgent solution in geological mineral exploration and factory production. At the same time, we must strive to make rather significant achievements in research and development concerning new realms of geological S&T in a short period of time.

Besides solving problems of principles, planning, and policies, we also must focus on solving systems problems to achieve the goals of struggle outlined above. Reforms in S&T systems involve complex social systems engineering and must be carried out in conjunction with system reforms throughout geological work. We should deal with the relationships between "dependence" and "orientation," between tasks and disciplines, between the present and the long term, between adherence to the focus on geological mineral exploration and expanding the range of services, between good work in opening up to the outside and completing domestic tasks, and so on. We must be unwavering in reforms and dare to explore and the actual steps and methods taken should be chosen carefully. The content of major reforms, of course, should be tried before they are extended. All scientific research units should improve their conscious adherence to the need for S&T to be oriented toward economic construction and geological mineral exploration. Based on the five demands made by Comrade Zhu Xun [2612 6064] [first vice minister, Ministry of Geology and Mineral Resources] at the Bureau Directors Conference in early 1984, we should be creative in providing good services. Leading elements in scientific research organizations at all levels should reinforce ideological and professional construction and they should have an unwavering and unbending spirit of daring to open up. This is especially true of the first and second levels, which should take complete responsibility for uniting all employees to push forward with system reforms in scientific research. Geological and mineral departments, mineral exploration departments, economic management departments and personnel departments at all levels should cooperate closely with S&T departments and work together to provide advice and make an effort to reform S&T systems and promote scientific and technical progress.

The CPC Central Committee has proposed that we should acknowledge fully the deciding role of scientific and technical modernization in the four modernizations drive during the Seventh 5-Year Plan. Leading cadres at all levels should understand the situation more clearly and have a greater sense of urgency concerning reliance on scientific and technical progress. How can leading cadres rely on S&T progress? Comrade Zhao Ziyang has pointed out

that first, we should encourage the initiative of S&T personnel, second, we should provide projects for the S&T battlefront, third, we should create the conditions for S&T work, and fourth, we should open up the road from application of S&T achievements to production. This requires our earnest achievement. At present, we should adhere resolutely to implementation of CPC Central Committee decisions concerning reforms in S&T systems, achieve further implementation of policies concerning intellectuals, continue to overcome the tendency to neglect knowledge and talent, develop an atmosphere of respect for knowledge and skills and create better conditions for S&T personnel. There are many comrades in the older generation of geologists in our staffs who have struggled all their life and provided us with models of self-sacrifice to the cause of geology, while advanced workers continue to appear one after the other from among young and middle aged geological workers. They care not for personal concerns, do not fear difficulties, are bold and innovative, struggle to make progress, and have displayed obvious achievements under arduous conditions. We must motivate all fighters on the geological battlefront before we can arouse a succession of high tides in geological S&T and make greater contributions to invigoration of the field of geology and promotion of systems reforms.

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NATIONAL DEVELOPMENTS

HIGHER MEDICAL EDUCATION INSTITUTIONS EXPANDED

OW141114 Beijing XINHUA in English 1051 GMT 14 Feb 86

[Text] Beijing, 14 Feb (XINHUA)--China opened ten new medical colleges during the Sixth Five-Year Plan period (1981-1985), bringing its total to 118, while graduating nearly 125,000 new doctors.

New enrollments last year at the medical colleges--western and traditional, undergraduate and graduate--reached 39,700 (27 percent more than in 1980) while total attendance was 149,800 (8 percent more).

The country's 80 postgraduate medical and pharmaceutical colleges and 25 research institutes enrolled more than 9,800 students in the past five years, four times more than were enrolled between the founding of new China in 1949 and the beginning of the "cultural revolution" in 1966, when advanced medical education ceased for nearly a decade.

The number of students at postgraduate medical schools last year was 8,200, 2.2 times that of 1980.

During the five-year period, 4,400 medical postgraduates graduated during the period, the figure being six times more than that in 17 years before the "cultural revolution."

In the past five years, China also began new programs in nutrition, medical jurisprudence, biomedical engineering. Four new colleges of Chinese traditional medicine began teaching Mongolian and Tibetan medicine, and an acupuncture college is being built in Beijing.

Teaching programs in seven major medical areas such as general medicine, traditional Chinese medicine, hygiene, oral surgery, pediatrics were revised and republished between 1981 and 1985.

Also during the period, the floor space of libraries in medical colleges grew by 44 percent, funding for the libraries increased 15 percent and collections of books grew by 19 percent.

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CSO: 4010/1038

NATIONAL DEVELOPMENTS

CALL FOR YOUNGER LEADERS IN S&T ACADEMIC FIELDS

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S & T] in Chinese No 11, 15 Nov 85 pp 2-3

[Article by Pang Qinghai [1690 1987 3189]: "The Question of Making Academic Leaders Younger in Average Age Is Already Extremely Urgent"]

[Text] Currently there is a loud cry for selecting young cadres, young entrepreneurs, and young artists. Conversely, the attention paid to the question of selecting and appointing young scientists is far from adequate. Is it because this question is not that urgent and not that important? Obviously not. Not long ago, we made an investigation of the age makeup of 32 academic leaders in 29 specialities, and of their reserve contingent, in 11 research institutes directly under the [Liaoning] Agricultural Sciences Academy. The results of the investigation showed that among the 32 academic leaders none were under the age of 45, and that some of their assistants and reserve forces tended to be old, with the academic level and professional capability of some being fairly low. Some of them had spent too short a time in the practice of scientific research, and it was hard to judge their quality; there are very few of them who can straightaway be replacements for the academic leaders. Academic leaders cannot be trained overnight. Not only is the training a process of maturation, but it is also a process of being recognized by their colleagues in society. This process requires a suitable period of time. Beginning now, we must get a tight grip on solving the problem of training young academic leaders.

This situation often occurs: we see that a certain person is a budding talent, but, for a variety of reasons, we do not have the nerve to employ him. At present, with regard to the question of employing young people, the situation in the party and government fields seems to be a little better. But in the academic field, because of the relationship of such factors as the alignment of years and achievements, a leader generally does not have the nerve to select young people with ability to take on the first-line tasks of scientific research, and thus the training and employment of young academic leaders is put off. In employing young academic leaders, we should study the spririt of courageously making use of new persons that was displayed by the former women's volleyball coach Yuan Weimin [5913 0251 3046], and put a little more stress on the "courage to use people." How was it that persons of talent in women's voleyball could come forth in large numbers with never a decline in

the number of recommendations? One important reason was that there was the nerve to employ new persons.

In training and choosing young and middle-aged academic leaders, there needs to be the courage to not fear censure, the courage to help sustain and employ those talented persons who are in the embryonic stage and in the budding stage, so that they rapidly mature and "exude fragrance and blossom in a riot of color." What is even more needed is the courage to take a little risk. This is because if things are not done well one will incur all sorts of censure. The commendable part of the courage to use persons lies herein. We should advocate the courage to use persons and encourage the constant selection of new persons. The relevant departments should make it a rule to give those who boldly employ new persons and those whose achievements are outstanding an "award for employing new persons."

To accelerate the training of young academic leaders and promote their rapid maturation, it is necessary to take a series of complete sets of measures.

1. Change concepts to create an atmosphere of fostering the maturation of youths. We must correctly understand the relationship between scholarly attainments, qualifications and record of service, and ability under the conditions of the new technological revolution and the information explosion in society. We must reverse the tendency to give more weight to qualifications and service record than to ability, and to give more weight to scholarly attainments than to standards. We must get rid of the old sequence in which seniors aere put ahead of juniors, encourage young and middle-aged scientific and technological talents to become top-notch as fast as possible, and advocate the habit of rewarding and promoting the less advanced and sustaining youths, and of welcoming other people's overtaking of oneself.

2. Set up special academic columns for youths in relevant academic periodicals. Academically, it is not easy for youths to get attention. Even if they have some original ideas and have made contributions, because their academic positions are not high, and the works of the lowly carry little weight, it is difficult for them to get their treatises published. Thus this makes them shrink back at the sight of the difficulty in writing and publication, a situation which hampers the development of their academic ideas and the raising of their academic level. In the literary world there is a magazine called CHOU XIAOYA [UGLY DUCKLING], which specially publishes the literary works of young people. Can our academic periodicals devote a certain space to running a special column that specially publishes the academic treatises of young scientific and technological workers who are under 30 or 35 years old? Can they formulate a [illegible] under the condition of equal quality, in which the treatises of young [illegible] are given priority in selection, so as to promote the display of their talents as early as possible?

3. Set up an academic fund for youths. We must encourage young scientists and technicians to explore new ideas, new technologies, and new methods, so as to solve practical problems in scientific research and in production. We must encourage young scientific and technological workers to put forth new viewpoints, and allow them to select their own topics and apply for funds. After a special organization investigates and proofs the new viewpoints and

selected topics that they have put forth, if it is discovered that a viewpoint has potential or that a selected topic has the necessaries and conditions for being started, support will be given to the youths from the academic fund. We should give awards to young scientific and technological workers who have had their academic treatises independently published in the academic periodicals at the provincial level and above. To insure the rational use of the academic fund for young people, the relevant departments can set up a fund committee, similar to an appropriations committee, which will be responsible for examining, granting, and supervising the academic fund.

4. Rapidly lower the average age of members of the academic organizational structures at all levels, and replenish academic organizations at all levels with outstanding young and middle-aged scientific and technological backbone elements. We should especially draw scientific and technological backbone elements who are under 35 years old into the academic committees of the academy and its institutes and into leading organizations of learned societies at all levels, and let them take part in the organization and leadership work of academic activities.

5. Give outstanding young scientists and technicians the "opportunity" by creating for them space for developing upward. "An implement must be tested before it can be known whether it is sharp or dull; a horse must be ridden before it can be known whether it is a jade or a fine horse." In practice, "sorting out the fine gold from the sand" is an important means of selecting outstanding young scientific and technological talents. To make young scientists and technicians mature rapidly, we should give them the opportunity to be tested, and create an "opportunity" for able people to develop.

9727
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NATIONAL DEVELOPMENTS

QUESTION OF RATIONAL MOBILITY OF TALENTS EXAMINED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 11, 15 Nov 85 pp 15-16

[Article by Chen Jin [3088 6651] and Zhu Junkan [2612 6874 0170] of the Jiangsu Provincial Academy of Social Sciences; Wan Li [5502 0500], responsible editor: "On 'Reasons' for Rational Mobility of Talented Persons--View by Science of Talent Economics of Mobility of Talented Persons"]

[Text] I. Mobility of Talented Persons Is Necessary for Social Reproduction

The process of reproduction is a process of constant renewal and constant repetition. It includes the reproduction of talented persons. The mobility of talented persons is an important link in the objective process of reproduction. The fundamental reasons why talented persons are mobile and why they gravitate toward a certain constellation of talents do not lie in the subjective will of the talented persons, but rather lie in the process of the objective movement of social reproduction.

The process of social reproduction is a process that includes the combination of workers among the talented persons with the means of production. Without this combination, it would be impossible for society to maintain its own existence. In a self-sufficient natural economy, the worker and his means of production are, from first to last, combined. The reproduction of his own labor power is, to a considerable degree, a process of labor for the purpose of consuming the products of his own production. Therefore, from a look at the whole process of social reproduction, we see that the reproduction of labor power is a reproduction for the purpose of satisfying his own needs for existence.

In large socialized production, the worker and the means of production are separated and become two poles, each with an independent nature. In a capitalist society, the workers do not have any means of production. To maintain its own existence, society must force the workers to be the main body in society and to combine with the objects of society and the fixed means of production. The objects have their own laws, and the worker must combine with the objects, which means that he must make the scale, rate, and structure of the reproduction of his labor power serve the needs of the laws of the objects. Under socialist conditions, in which the ownership by all the people

of the means of production occupies the dominant position, the worker combines his own labor power with the publicly owned means of production. The purpose of the product of his labor is to satisfy the needs of society and not just his own needs. He puts up the sign of collective labor, and does not work for the products of individual labor. Therefore, what kind of labor the individual does, and what place the labor is in the spatial position of the means of production, are essentially decided by the needs of social reproduction.

Because the reproduction of labor power revolves around the goals of the entire social reproduction, the mobility of that part of the labor power that is in the reproduction of labor power is also decided by the goals of social reproduction. Compared with the small-peasant economy, the great development of productive forces by large industry sets off a large-scale circulation of materials, currency, and information; this also imposes demands on the mobility of labor power. Because talented persons generally have a certain specialized skill, their interchangeability is low, and it is easier for them to be affected by a change in the division of work, they possess more mobility than the general worker. Experience shows that the rate of development of productive forces is directly proportional to the rate of the mobility of talented persons.

People are a unity of workers and consumers. The mobility of a talented person, from the angle of the individual's aspirations, seems often to be based on the hope that he will go to a place that is advantageous for his individual consumption. But in essence his mobility is that of a worker, and the reason that a constellation of talents is willing to accept a certain talented person is because his labor far oustrips his consumption level. Therefore, speaking fundamentally, the mobility of talented persons is not decided by the individual's aspirations, but by the needs of social reproduction. Without the needs of a certain production unity, no talented person can realize his aspirations for mobility.

II. The Mobility of Talented Persons Is a Relation of Adjustment to the Requirements of Social Reproduction for Talented Persons

The entire social reproduction process includes three aspects: the reproduction of material means, the reproduction of labor power, and the reproduction of production relationships. The reproduction of talented persons is a relatively independent part of the reproduction of labor power. Each of the above mentioned forms of reproduction has its special laws of movement. To insure the entire benefits of its production, society must regularly coordinate the movement of all the parts, and this includes readjusting the means for effecting the mobility of talented persons.

First of all, the reproduction of material means is phased amid regular changes. Following changes in production, replacement of technologies, and readjustment of the industrial structure, some production units will probably no longer need certain specialized talents that they had originally, and instead will need other types of talented persons. This requires the readjustment of the mobility of talented persons.

Second, talented persons are placed in a certain production relationship, where they jointly carry out production with other workers. For various reasons, a talented person could be in a certain environment that is not conducive to the display of his initiative and creativity. In that case, the best thing to do is to let him change to a suitable environment.

Third, because the level of abilities of a talented person has been raised, he feels that in his original post he cannot utilize all of his abilities. In that case, consideration may be given to arranging a suitable post for him.

Fourth, after society has assigned a talented person to a certain unit, it is possible that the post and his speciality will not match. Generally speaking, this assignment also needs to be readjusted.

Fifth, the reproduction of talented persons sometimes will fall back to the reproduction of material means, creating a situation in which the supply of talented persons cannot meet the demand. Under circumstances in which the total number of talented persons is insufficient, there should be a readjustment, based on the economic and social benefits of all units, of the demand for talented persons.

For social reproduction to realize its overall benefits, there must be an optimum combination of the workers and the means of production. Under the various above mentioned circumstances, when the allocation of talented persons exceed the demands of the production of material means, there will be created a waste of manpower resources; when the allocation of talented persons cannot satisfy the needs of the production of material means, there will be created a waste of material resources. The mobility of talented persons is an extremely important means of avoiding waste in social reproduction.

In form, the mobility of talented persons is the spatial displacement of talented persons, but in substance it is the redistribution by social reproduction of talented persons in all departments, areas, and units of the national economy. With talented persons moving back and forth, although their total number temporarily does not change, there is a change in the mutual relationship between talented persons on the one hand and the means of production and the labor collective on the other hand, forming a new structure in the overall arrangement of productive forces.

III. Organize the Rational Mobility of Talented Persons To Consciously Promote the Development of Social Reproduction

In the mobility of talented persons, some of it is rational and some of it is irrational. All things that are advantageous for the talented persons showing to a greater degree their ability to promote the reproduction of talented persons themselves; all things that better combine them with the means of production to promote the development of productive forces; and all things that better combine them with all kinds of direct production relationships to promote the development of production relationships--are rational. What does not do these things is irrational.

The mobility of talented persons has its objective laws. We must organize the rational mobility of talented persons, and not just stop at the stage of individual and spontaneous mobility of talented persons. Departments that organize the mobility of talented persons are intermediaries between the talented persons and the units that require them. They are bridges that link specific abilities with places where these abilities can be displayed. They are ways to attain the goal of the reproduction of talented persons.

A talented person has a specific ability. This ability is based on the needs of society and the corresponding price to be paid for training him in this ability. If, after training, this ability is not used or only partially used, then the goal of producing a talented person will not be reached or not completely reached, and the process of a complete production of a talented person also will not be finished. If he is not used at the post where he is most needed by society, then the reproduction of a talented person will not have reached its optimum goal, a situation which will be detrimental to the greater development of the reproduction of talented persons. The basic requirement for the reproduction of talented persons is using social resources in a prioritized and rational way, training all levels and all types of special talented persons in a planned and proportionate way, and timely satisfying the demand for talented persons by all units during the development of the national economy. When there is no coordination between the talented person who has already been trained and is at his post and the requirement of the relevant unit, there needs to be a readjustment by moving him. Therefore, the basic law of the mobility of talented persons is, during the readjustment of social production, in the relationship of the relevant social group's requirement for a specific talented person on the job, the talent must be matched to the post and the talent must be used to the best advantage, thereby promoting the coordinated development of all parts of social reproduction.

The inherent law of the mobility of talented persons cannot be defied. This law will certainly be reflected in the production practice of the units that use the great majority of talented persons. In our formulation of the relevant policies and administrative measures for the mobility of talented persons, we must conform to and make use of this law, adroitly guide action according to circumstances, and consciously organize the rational mobility of talented persons. If we obstinately violate this law, we will be bound to hamper and damage social reproduction.

How are we to organize the rational mobility of talented persons? The organization of rational mobility requires that we smash the barriers of selfish departmentalism in departments, areas, and units. It requires that we apply economic, administrative, legal, and educational measures to timely effect a redistribution of specific talented persons in the relevant departments, areas, and units of the national economy. It requires that we "broaden and shorten the path of flow" in order to shift talented persons to a constellation of talents where they will better suit the overall interests of the entire nation and better satisfy the needs for talented persons in economic and social development. This is the basic requirement of the basic law of the mobility of talented persons.

IV. The Principles for Guiding the Rational Mobility of Talented Persons

To judge whether the mobility of talented persons is rational or not, we must make a systematic analysis of the entire flow circuit of talented persons, and we must not just observe the direction of flow in an isolated, oversimple, and superficial manner. Based on the state of development in our country's present stage of productive forces, how are we to guide the rational mobility of talented persons? Generally speaking, we may refer to the following principles for the mobility of talented persons.

1. Is it advantageous for better uniting the knowledge capability of talented persons with the requirements of their posts? 2. Is it advantageous for multiplying the abilities of talented persons? 3. Is it advantageous for forming a better population structure of talented persons and a better population structure of staff and workers? 4. Is it advantageous for forming a better relationship between people that respects talented persons? 5. Does it give priority to satisfying the needs of posts, units, and areas that require a large amount of intellectual labor? 6. Does it make full use of the superiority of the geographical features of nature and of the social environment? 7. Does it give priority to satisfying the needs of units in which the rate of marginal labor is high? 8. Does it give priority to satisfying the needs of units which, in the overall situation of the national economy, need to be especially strengthened?

Of the abovementioned principles for guiding the mobility of talented persons, the first four lay particular emphasis on readjusting the relationship between the talented person as an individual and the unit, and the last four lay particular emphasis on readjusting the proportion of talented persons among all units. The basic requirement when handling the various relationships is that the utilization of talented persons must to the greatest degree possible suit the interests of the entire society, appropriately handling the matters concerned and step by step creating full confidence in the rational mobility of talented persons, so as to promote the coordinated development of social reproduction.

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NATIONAL DEVELOPMENTS

CURRENT WORK ON MOBILITY OF TALENTS VIEWED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 11, 15 Nov 85 pp 17-18

[Article by Jie Jiale [7327 0857 2867]: "Appraisal and Analysis of Our Country's Current Work on Mobility of Talented Persons"]

[Text] Following our country's switch of its strategic key point and the development of economic construction, the form of allocation by sole reliance on planning is already far from satisfying the need for the mobility of talented persons. The pressure of circumstances and tasks has caused people to try hard to find a path of reform that will open new channels for the mobility of talented persons. Therefore, in various places throughout the country exchange service organizations have sprung up like bamboo shoots after a spring rain, emerging as the times require. Movement of intellects in many forms have also broken through all sorts of barriers all over the place. This article is an attempt at a basic appraisal and preliminary analysis of the present work in the mobility of talented persons.

I. Questions and Trends Worth Attention in the Mobility of Talented Persons

Following the development of the economic situation and the acceleration of the pace of reform, there have also appeared some new situations and new questions in the current work of exchanging talented persons. It is necessary for us to carry out an analysis and study before we can grasp the trends, improve the measures, and promote the advance on a sound track of the exchange of talented persons. From our understanding of the analysis of the situation, there mainly are the following aspects in these questions and trends:

1. The Question of the Rational Direction of the Flow of Talented Persons

Recently, in order to get in touch with the work of exchanging talented persons, we visited about a dozen factories in our city that are under the National Defense Science, Technology, and Industry Office and the China Ocean Shipping Company. Most of these factories are located in remote mountain districts, and, because of the relaxation in policy, in recent years talented persons have moved around constantly. But, of the specialized technicians who have moved, more than 80 percent have moved from the mountain districts into big cities. Also, based on an analysis of the reports and letters from

outside that invite applications for jobs and the requests for transfer made by the specialized technicians in their own factories, the momentum of the countercurrent of talented persons is increasing, not decreasing. This phenomenon is widespread throughout the country, because an analysis of the statistical figures on talented persons in some large coastal cities shows that it is a universal phenomenon for more of them to go into large cities than to leave them. Therefore, the question of stopping this countercurrent of talented persons and insuring a rational direction of their flow is very worthy of attention.

2. The Question of Preventing Blind Introduction of Talented Persons From Elsewhere

This blindness is mainly manifested in two extremes: The first is blind opposition to anyone from outside. The logic of people who are like this is: because it is hard to get talented persons, the people who are sent in exchange by outside areas or units certainly are not talented persons; if they were talented, they would not have been sent in exchange. The other extreme is to consider the introduction of talented persons to be fashionable. People like this do not make a careful investigation and analysis of the resources in their own areas. When they investigate and calculate that there are no resources of talented persons, then, no matter whether there is a need or not, they only want people with records of formal schooling and diplomas. They introduce them without exception and rigidly assign them to their subordinate units. They only care about introducing them, not about using them. Their guiding idea is that the "introduction of talented persons is an advantage, not a disadvantage." They make a so-called "reserve of talented persons," and go so far as to create a new waste of talented persons.

3. The Question of Making Talented Persons Into Commodities and Giving Them Freedom of Mobility

Following the expansion of the scope of the mobility of talented persons, many new forms have appeared. There is a question of whether the methods of mobility are appropriate or proper. In the current work on mobility, there has appeared a tendency to make talented persons into commodities and to give them freedom of mobility. Some units make the mobility of talented persons part of county fair trade, and, like a free market drive up prices, and "hoard" talented persons. With economic measures that exceed the regular norms, they "undermine the foundation" everywhere, and even make a bid of several tens of thousand yuan to be given to a specialized talent himself as a "present on first meeting him" in order to "reassure" him. Some areas, on the excuse that they "permit resignations," and which do not want administrative letters of introduction, and do not want any salary, household grain, or CPC and CYL relationships, without authorization invite talented persons to apply for jobs. Some specialized technicians go wherever the price for them is high, leaving without saying goodbye. They even take along some technical materials from their original units to use them to drive up their own price. This tendency to make talented persons into commodities and to give them freedom of mobility often harms the interests of the state, and to a certain degree it creates chaos.

To solve this problem of making talented persons into commodities and giving them freedom of mobility, we can neither "give up eating for fear of choking"--refrain from doing what is necessary for fear of a slight risk--and block the channels for the mobility of talented persons, nor let this tendency develop and cause a chaotic situation. Proceeding from the principle of respecting knowledge and respecting talented persons, we must, based on specific circumstances, improve their working conditions and treatment, use them according to their talents, and arouse in the specialized technicians the spirit of self-respect, self-dignity, and self-regard, and the spirit of making, with one heart and one mind, contributions to the state and the people. We must avoid the vicious cycle of "once there is control there is rigidity; once the control is released there is chaos."

4. The Question of the Relationship Between Introducing Talented Persons and Tapping Potential

Since the focus of work was shifted to economic construction, one frequently hears the leaders of some departments and units sigh that they lack talented persons, but the phenomenon of "when flowers blossom behind the wall their fragrance is smelled outside the wall" occurs at times. Some units make a tremendous effort to go to other places and invite talented persons to apply for jobs, while the talented persons in their own units remain idle and unused. Some leaders look upon talented persons who have been engaged by application as priceless treasures, give them material benefits, and give them every kind of special treatment. They turn a blind eye to their own talented persons and show no interest in them. This dampens the enthusiasm of their own talented persons, makes them discontented with their work in their units, and also makes them want to solicit help from potential backers to get invited to another job. To find out how to handle the relationship between introducing talented persons and tapping potential, we must look at the actual situation in the unit. However, the introduction of talented persons must be done on the basis of fully utilizing the potential of the talented persons already in the unit; otherwise, it will be disadvantageous to the management of talented persons and to economic construction.

5. The Question of Specialized Diplomas and Technical Level

In the work of introducing talented persons, the leaders of some units onesidedly stress specialized diplomas and ignore the actual technical level. When deciding whether to introduce a certain person, they oversimply make his record of formal schooling and his diploma the sole basis for making their decision and are unwilling to find out his actual technical level. This practice often adversely affects the actual effect of introducing talented persons. This is because, although his record of formal schooling and his diploma show that a person has received fairly systematic and concentrated intellectual training, and to a considerable degree indicates a person's intellectual level, the record of formal schooling and the diploma are not the only basis for judging whether a person has genuine talent. The practic of many enterprises in introducing talented persons proves this point. Therefore, the determination of the objects of introduction must be made on the basis of a specific analysis of the needs of the unit. If it is a matter of solving problems in theoretical exploration and design, then the unit will

want a comrade with a record of formal schooling and a diploma to undertake the task, and, relatively speaking, the results will be better. But if it is a matter of solving problems in operating techniques and other technological practice, then the introduction of a technician who has a fair amount of practical experience will often lead to quicker results.

II. The Fundamental Measures for Dredging Channels for the Mobility of Talented Persons Lie in Reform of the Systems

Currently, the obstacles to the mobility of talented persons mainly stem from the ownership of them by the department or the unit. However, the department and the unit have the ownership and so they form barriers that are difficult to break through. The fundamental reason is that in the personnel management system, as as in the closely interrelated wage system, welfare and insurance system, and houseld grain management system, which have been formed over a long time, there exist parts that are irrational and imperfect, parts that produce and consolidate these malpractices. Therefore, we must thoroughly eliminate the malpractices, remove the obstructions, and dredge channels for the mobility of talented persons. The fundamental measures for doing this lie in reform of the systems.

From where do we start the reform of the systems? I think that the central problem in reforming the system for the mobility of talented persons is to create external conditions that will promote the rational mobility of talented persons. The conditions for the mobility of talented persons may be roughly divided into two types. One type is the quality of the talented person himself, that is, the internal condition. It includes his political consciousness, the depth and breadth of the knowledge he has mastered, his technical level, his individual interests and hobbies, his health, as well as his disposition. The other type is the external conditions, which roughly include the following:

1. Social requirements. This means the plans for coordinating talented persons for economic construction, including their distribution, structure, and proportion, in order and in place.

2. The application and improvement of their specialities. This means a job suited to one's special training, so that one can display one's specialized skill or knowledge, having the necessary work environment and opportunity for study and for advanced studies.

3. Material life. This means such things as the geographical environment, natural climate, welfare and treatment, housing, arrangements for family members and children, as well as the communications situation.

4. Spiritual life. This means such things as the relationship of getting along with one's leaders and colleagues, cultural life, admission into the party, assessment of professional title, and being selected as advanced.

5. Administrative intervention. This means using administrative measures with a certain degree of compulsory intervention based on the needs of the state.

For various objective reasons--for example, conditions are good in some places and poor in other places--it is difficult to change some of these external conditions in a short time. However, by reforming systems we can provide compensation or assistance in certain forms, so that a rough balance is achieved. For example, a floating wage for specialized technicians on the front line of agriculture, forestry, and water conservancy is one means of effecting this balance.

For many years the only channel in our country for the mobility of talented persons has been planned development. When formulating these plans, there is often a lack of a strictly scientific attitude and scientific basis. The plans are formulated to satisfy the understanding or estimate of the general situation, and they are even mixed with the will of some senior officials. At the same time, excessive store is set on intervention by administrative measures, and not enough consideration is given to the specialized technicians' internal condition and to the other external conditions. As a result, all sorts of instances of malpractice have cropped up, which adversely affect the enthusiasm of talented persons and hinder the display of their beneficial results. We are now engaged in a reform of the management system for talented persons, and we must make an effort to create rational external conditions that are coordinated and unified with the internal condition of talented persons. This also entails coordinating and unifying the objective needs of society and the conscious demands of talented persons. By erecting a bridge between talented persons and society, we will cause the talented persons to continuously cross over to the other bank and be rationally used.

Based on the above viewpoints, in the reform of our country's existing personnel management system, I think we must put stress on handling well these relationships: the relationship between the individual's demands and the state's overall interests; the relationship between the partial interests of the department or unit and the overall interests of the state; and the relationship betwen administrative intervention and what the individual is interested in. These three relationships are also three contradictions. If these contradictions are resolved well, the development of economic construction will be promoted; if they are not resolved well, they are bound to hinder the development of economic construction. Therefore, we must pay sufficient attention to this matter.

With regard to dredging channels for the mobility of talented persons, based on our country's national condition, we still should give priority to planned deployment and carry out the necessary administrative intervention, but the forms of planned deployment need to be improved. Just like economic construction, first of all there must be more rationality in the plans. Next, with regard to methods, in addition to some plans of a directive nature, we should have some plans of a guiding nature, and within the scope of these plans give specialized technicians a certain leeway in their choices.

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NATIONAL DEVELOPMENTS

CHARACTERISTICS OF ENGINEERS, TECHNICIANS ANALYZED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 12, 12 Dec 85 p 20-23

[Article by Shen Chundao [3088 4783 6670], Huang Kexiao [7806 0460 1321], and Cheng Yonglin [2052 3057 2651]: "Characteristics of Engineers and Technicians Discussed"]

[Text] In a department engaged in such economic activities as production, transportation, and trade, every task has to be done through the coordination of the organic body composed of different kinds of people. Every individual in that organic body has his own obligations and responsibilities. As part of a group, there must be individuals in any coordinated activity. Looking at industrial production, among the large enterprises, the engineering and technological personnel from the top down need three kinds of people to coordinate. One kind is development personnel who are engaged in the development of production technology and the design of new products; next are technical personnel to solve practical problems such as manufacturing and testing; and the last are production operation personnel with certain kinds of technical knowledge or skills. Regardless of number or quality, the three kinds of personnel must meet the demands of the principle of skill levels in the science of modern management, that is, to assign a person, according to his knowledge, ability, and personal characteristics, to a position where his ability can be best used, and managers must be sure that in every task to which the person is assigned that he do his best to achieve the expected goal.

The above three kinds of people exist naturally among the enterprises; yet their titles and the interrelationships are rather confusing. The personnel in each category do not form a series and level which reflect their characteristics and channel their own development. Therefore, there have appeared many contradictions in the naming of the members of an enterprise, their classification, and their hierarchical structure.

In the past, people were used to calling the three kinds of personnel "engineers," "technicians," and skilled workers," with a certain kind of understanding that engineers are people in the higher echelon of the colony while the workers are in the lower echelon. "Everyone wants to be better off," so there existed among the personnel and workers in the enterprises a

unidirectional development, that is, from worker to technician and then to engineer, thus causing an unreasonable structure of personnel distribution among the enterprises which has resulted in restiveness among the workers and technicians, especially technicians and workers. The key to solving this contradiction is to have a reasonable distribution of work within the production colony, to form a scientific series, and to deal correctly with the relationships among different categories of personnel in order that every series and level have its own characteristics and is maintained at a relatively stable level to let the people in every series have a definite goal of development.

Based on the nature, demands, and objectives of the task and the requirement for management, we think that in modern enterprises, the engineering technology personnel which are most closely related to a production system can be divided into three series (see Figure 1).

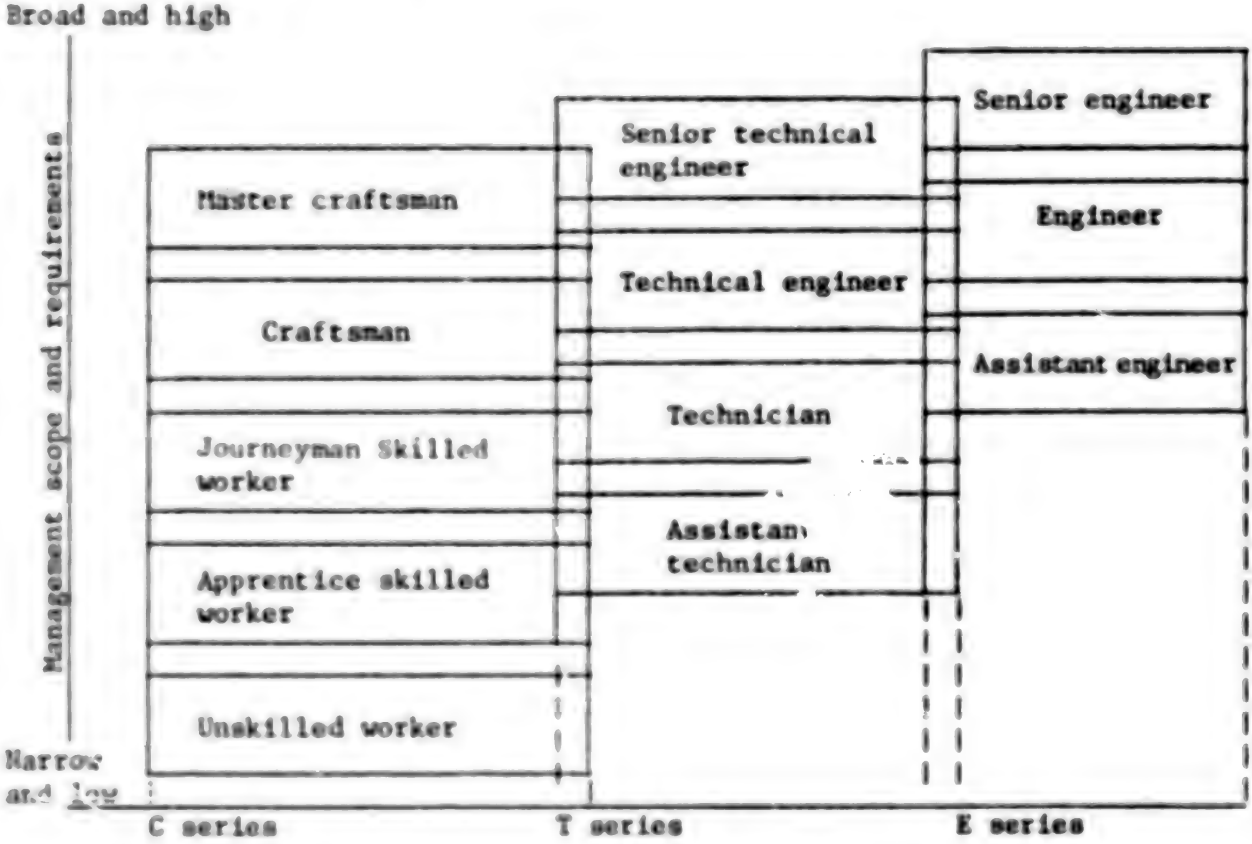

Figure 1. Ladder Diagram of Engineering and Technology Structure

We refer to the three series respectively as "C," "T," and "E." People in the "C" series are laborers who work most directly on the frontline of production. Their work is accomplished mainly through proficient skills, and they need a certain amount of theoretical fundamental knowledge. However, experience is more important, especially that which is closely related to

their specialized skill. They belong to the series of skilled workers and craftsmen. People in the "T" series are the organizers and technological guides who work in the frontline of production. They engage in developing product technology, assembly, testing, inspection, operation, and maintenance, and their work requires a certain professional knowledge and experience. This is the technician series. People in the "E" series are researchers in production technology and they engage in the work of engineering development and design, which requires a systematic scientific foundation and knowledge of engineering applications with certain practical experience in the work of production technology. This is a series with engineers as the core. In practical production activity, owing to differences in the working ability of the workers engaged in the same kind of work in the same series, there exist several different levels within a series.

In the "C" series there are five levels: 1) unskilled workers, who are operators and assistants in production and who work mainly through physical labor; 2) apprentice skilled workers (workers whose knowledge and skill are at levels 1-3); 3) journeyman skilled workers (whose knowledge and skills are at levels 4-6); 4) craftsmen (whose knowledge and skills are at levels 7-8); and 5) master craftsmen (whose knowledge is above level 8 and who have abundant practical experience and a corresponding level in theory). The "E" series consists of the three levels: assistant engineers, engineers, and senior engineers.

In the "T" series there are four levels: assistant technicians, technicians, technical engineers, and senior technical engineers (all technical personnel who manage production technology, engage in equipment maintenance and repair, or handle the power supply can be included and are called technical engineers). This is classified according to their specific work. If the "technician" is used as a reference point, with "assistant technician" and "senior technical engineer" at the two ends, the difference between the people in the four levels in the way they use their knowledge, skills, and abilities can be illustrated with this diagram:

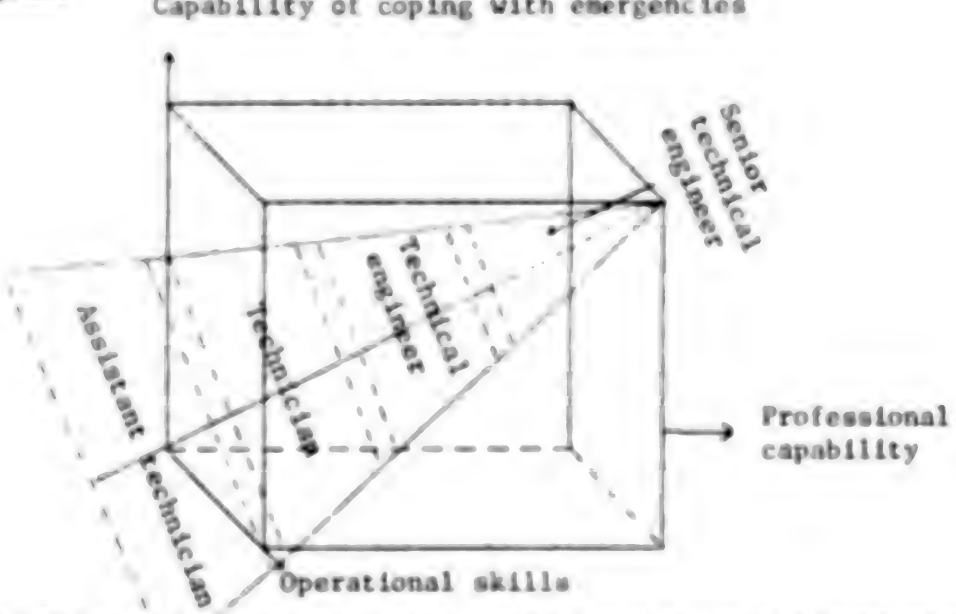

Figure 2. T Series Personnel Quality of Knowledge and Capability Structure Diagram

To achieve qualifications in knowledge and skills for "T" series personnel requires three basic factors: knowledge of professional theories, skills in professional operations, and the ability to deal with an emergency, which is a kind of managerial ability. We term them for short as professional knowledge, operational skills, and ability to deal with emergencies. The structure of knowledge and skills can be illustrated with three coordinates (see Figure 2). Based on the requirements of the three factors for the practice of production, we can draw corresponding ideal models of the structure of the knowledge and skills for technical personnel. Rotating around the diagonal line of the 3-dimensional model, we can get the Pyramid model for personnel in this series to illustrate the levels of personnel in this series. Thus, if the level of the personnel in that series is known, the structure of knowledge and skills will be approximated. It is not difficult to understand that the quality of knowledge and skills for the personnel in the C and E series can also be demonstrated with a three-dimensional illustration; however, among the three, there must be a difference in the values of "length," "width," and "height," and the angle of deviation from the main axis of the three ideal models will also be different from that of the three axes of the three-dimensional coordinates. This deviation is the mark which differentiates the knowledge structure of the personnel in the above three series. Thus, we see that in the colony of productive activity, there are three horizontally parallel series of technical personnel, and in an individual series, the ratio of the number of personnel in each series can be indicated by the Pyramid model. The structure of knowledge and skills of the personnel in each series is three-dimensional. The plane model which considers only knowledge and skills should be replaced by the three-dimensional model which considers all three factors of professional knowledge, operational skill, and ability to deal with emergencies.

Still another point needs to be explained, that is, no matter whether you divided according to series or echelon, it is not clear-cut. And the neighboring series or levels in fact are overlapping. This overlap indicates that each series or echelon has certain limits while the nature of the work of the people in the two series along the borders is similar or identical, and in general, it is difficult to say that certain tasks should be done by the people from this or that series or echelon. This is illustrated in the above two figures. This kind of overlap is an important guarantee to avoid a longitudinal or latitudinal breach in that organic productive colony. Nevertheless, the overlap should not be too great, otherwise confusion in responsibility and substitution at will may result. In fact, there are some differences in the quality and quantity of knowledge and skills among the different series and echelons.

The title of the personnel in each echelon is drawn from the titles in the "E series." The title of "technician" needs no explanation, and the title of "technical engineer" has been in effect established without conferring that title. In some other countries where a technical engineer and an engineer are the same, both are used as professional titles to confer on qualified people. The title of "senior technical engineer" is raised to correspond to "senior engineer" and it belongs to a higher level. It is the same with "senior technical engineer" mentioned in the following. "Assistant

technicians," are also called "apprentice technicians," indicates that they belong to the next lower echelon. With the title of the echelons for the workers, we can use the prefixes of "senior, mid-, or apprentice," for the unification of the titles, and to emphasize the relationship with corresponding echelons in the other series, except for the title of "nontechnical worker," "apprentice skilled worker" and "skilled worker," are simply referred to as craftsman and "advanced master craftsman." Thus, the relationship between series and levels will be easier to explain. For example, we can see directly from Figure 1 that with craftsman, technical engineer, and engineer, the nature of their work is different, yet looking at the engineering personnel as a whole, they are usually in the same echelon, and all are in the mid or upper level in that series while there is still another higher echelon above. Then, why should there be a difference in the illustration of the hierarchy while all three kinds of people are in the same echelon and are called "shi?" It comes from the difference of the limits and requirements of management, the nature and requirements of the work, and the target of the three kinds of people. In general, the work of an engineer in research and development directly affects the work of the technical engineers and craftsmen. First comes the idea of the engineer with a systematic consideration, with the ideas and work of the technical engineers and craftsmen being the continuation and realization of the ideas and work of the engineer. Therefore, with a task, from the initial thinking to its realization, the achievement required from an engineer has to lead to that of a technical engineer in a certain amount and that is why there are differences in the hierarchy. It is the same with the difference between a technical engineer and a craftsman. The ideas and the formulation of the flow chart and specifications for the production technology of a technical engineer ought to lead to that of a craftsman to a certain extent in applying his skills and finishing the product.

There are many theoretical models of the hierarchical structure of engineering and technical personnel and among them the most typical ones are the Pyramid theory and the "Professional Continuum" theory. We think that these theories are very useful in describing the hierarchical structure of the traditional organization of productive activity. Yet, at present, with the continuous development in production technology and progress of the importance in management, and when a series of new requirements for knowledge and skills must be met by the people for production activity, there are still many limitations.

The Pyramid theory shown as Figure 3 (strictly speaking, it is a plane pyramid theory) appeared earlier in the analyses of the hierarchical structure of engineering and technological personnel, and on some occasions, the two echelons of the "assistant and apprentice skilled workers" and "skilled workers" in the figure were combined into one echelon of "common workers." "Senior engineers" and "engineers" were combined into one echelon of "engineers." Using the Pyramid model, one can see directly the level of the echelon of the personnel, their titles, and the general proportion in the number of the personnel. But as mentioned above, there are many drawbacks, such as listing personnel of different nature into one series to consider the level of their echelon, which not only confuses the working characteristics

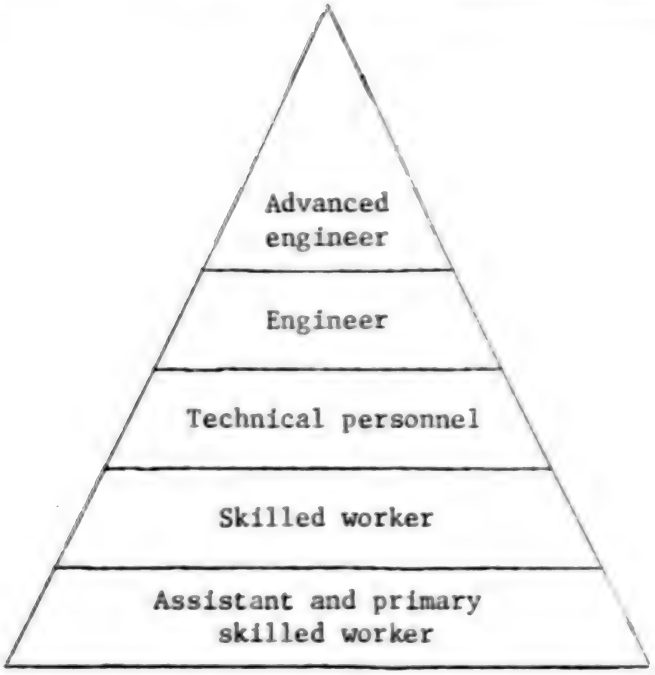

Figure 3. Pyramid Model of Engineering and Technical Personnel Level Structure

of different series but also limits the development of the people in the lower echelons. Besides, based on the diagram, the difference between two neighboring echelons is absolute; yet it is not so in reality.

Another model is the Professional Continuum model (see Figure 4. In the figure, C means craftsman, T technician, TE technical engineer, and E engineer). From this model, one can see the process of the formation of personnel in the series of technicians and the relationship between the hierachical structure of engineering personnel and education in engineering and technology. It solves many problems which people have tried to solve for a long time. That is the great merit of the Professional Continuum theory. In addition, the Professional Continuum model also considers the overlap of the two neighboring echelons and indicates that there are many people in an area with very vague borderlines and that it is difficult to differentiate and easy to get confused. The diagonal line illustrates the proportion of practical operational ability and basic technical knowledge for personnel in different categories to be able to see the difference between different categories of personnel. Even though there is much merit in the Professional Continuum theory, the overlap in it still limits the development of killed workers and technicians, that is, the development of skilled workers can only draw close to technicians in knowledge, skills and ability while technicians can only develop toward engineers in the areas of knowledge and ability. The result of this kind of development is sure to make these people break away from their original working characteristics to lose their original superiority in knowledge and skill, and eventually the development can only go one way, toward engineer. The Professional Continuum theory divides the people into three echelons of "skilled workers," "technical personnel group," and "engineer," whose shortcoming is that people in a different line of work cannot be listed naturally into series which reflect the characteristics of the people in different categories, and neither can it preserve the original superiority in knowledge and skill. If we divide the Pyramid model in two

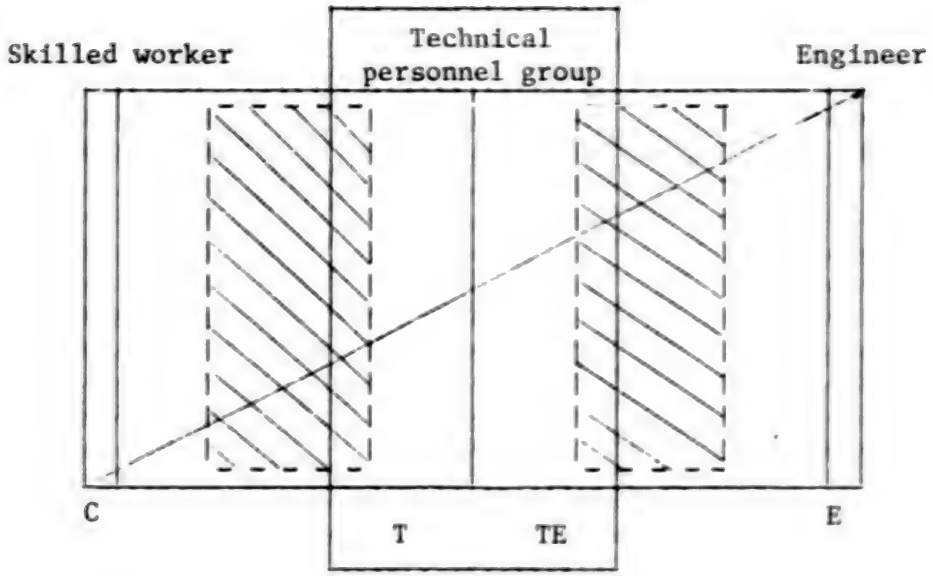

Figure 4. Illustration of Professional Continuum Theory

and then put it sidewise, the illustration will be very similar to the Professional Continuum model. Thus we know that the Professional Continuum model still has the defects of the Pyramid model.

The step structure of engineering and technical personnel (see Figure 1), based on the nature and characteristics of work, listed three series with characteristics of their own. Thus the development of people in various categories will be able to go toward the climax of their own series, and a skilled worker does not have to develop himself through the pattern of "skilled worker," "technical worker," and "worker engineer," only to cause new problems in the structure of the enterprise. And all the people, especially people in the C and T series, can set their minds and feel at ease with their work and position and try to raise and cultivate their capacity related to their work. If the development progress is according to Figure 1, then either in reality or in theory, the status of being high or low in their work will be eliminated, for example, a technician's level in theory is not necessarily lower than that of an engineer in the engineering category, and it is entirely possible that he may surpass that of an assistant engineer. This step illustration absorbs the overlap of the Professional Continuum theory, which indicates that there is nothing clear-cut between neighboring series or echelons. Of course, this step illustration is not perfect either and we need further probing to perfect it.

It is a very important work to probe the series, echelon, and naming of engineering and technical personnel, and it takes a long-term effort to be able to arrive at a relatively unanimous view. To do this well, not only can we straighten the latitudinal and longitudinal structure of engineering and technical personnel, but it also has an important significance in the

formulation of the correspondence school system and education plan, on reasonable specifications of responsibility, to be able to predict talent needs correctly and reasonably assess their titles, such as to assess a technical title.

To assess a title, we must grasp the series and echelon of the technical personnel and understand the number of the titles and the requirements for promotion. Based on the nature, requirements, and target of the work of the engineering personnel and scope of management and requirements, we divide the titles of engineering personnel into 3 series and 12 categories (if unskilled worker, apprentice skilled worker, and skilled worker are taken off, there are 9). Since the nature of the work of people in the three series is different, there are differences in quality in the requirement for their promotion and the degree of requirements for every level in the same series is also different. Nevertheless, there are some general principles, that is, the requirements are mainly the following to be used for assessment in promotions:

1. Theoretical basis and its progress (education, degree, and on-the-job training).

2. Practical working capability (awards in various degrees of scientific and technological achievement and awards for technical innovation).

3. Achievement in theoretical study (quantity and quality of papers published).

4. Level of foreign language(s) (number of languages mastered and to what degree).

5. Level of required knowledge and skill.

6. Popularity (degree of influence on the society, generally divided into five degrees).

7. Working attitude and ethics in scientific and technological study.

8. Seniority.

Characteristic differences in different series are reflected in the difference of the positions in the arrangement and the quantity required for the knowledge and skill structure and quality according to these factors to award different titles to qualified people. There are different assessments for different people. We cannot directly put qualified people assessed with different standards into one fold with the same title, but we can make the title show the difference in the quality of the people in order to raise the efficiency and reliability of the title. To make the title for promotion more scientific, the assessment should be quantitive, and we should use level analysis or grading. Thus we can proceed with a comprehensive assessment according to the criteria, that is, to determine the power and fraction according to the criteria, in order that the engineering and technical personnel may have a correct assessment, in order to determine whether or not they will be promoted.

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MAKING MOST OF OLDER S&T PERSONNEL URGED

Beijing GUANGMING RIBAO in Chinese 16 Feb 86 p 1

[Article by Yu Weidong [0060 4850 2767]: "Continue To Make the Most of Engineers and Technical Personnel Over 50"]

[Text] Over the past few years, leading groups in China's enterprises have undergone two large rectifications, the first in 1982-83 and the second in 1984-85. After these two rectifications, a large group of new people who fit the conditions for "modernization" were promoted to leadership positions of authority, of which those in their 40's formed the backbone of the enterprise leading groups. Based on statistics for 18,000 leading cadres in more than 3,000 medium-sized to large key enterprises, 20 percent of them were under 40, 63 percent were from 41 to 50, and 17 percent were over 51, with an average age of 45. At the same time as this, a group of engineers and technicians over 50 in various leadership and work positions of authority in enterprises (including technical positions of authority) retired. How now to continue making the most of engineers and technicians over 50 is a new problem that has been encountered by enterprises.

For the most part, engineers and technicians over 50 are basically sound: they are familiar with their work, knowledgeable of the situation, and rich in experience. In many factories built during the 1950's, they have been around as long as the factory, and many know the histories and situations at their factories like the palms of their hands. They have contributed their best years and their greatest energies to these enterprises. For some 30 years they have been buffeted back and forth, but never have they lost their faith, and now although they have reached the years of retirement they still wish to contribute their own experiences and knowledge-- "there's no need to whip them into place." This valuable and reasonable desire ought to be able to be satisfied.

Naturally, those over 50 have their own shortcomings. They have been around for half a century and their physical strength is on the decline, and the functions of several organs are weakening. Consequently, their ability to receive and process information is also weakening, and their knowledge of new things is insufficient. These shortcomings have made them unsuited for certain first line leadership work that is urgent and greatly tasking, and it is absolutely necessary to turn this work over to younger comrades in their

30's and 40's. Therefore, although their physical strength has begun to decline, their intellect is still at its peak, and their experience is broad so that their consideration of problems is usually reliable and thorough. The children of people in this age group have usually grown, family responsibilities have lightened, and they can spend more time considering and acting on work and professional problems. For these reasons, as long as we can deal correctly with these strengths and shortcomings and can make the best of the situation, the 50's can be a time when a person can accomplish much.

Based on the subjective condition that currently employed engineers and technicians over 50 will not be given new responsibilities and on the objective requirements for the technical transformation of enterprises, generally speaking, we can better use them in the following kinds of work:

1. Enterprise development of goals over the medium to long term, planning development, and strategy development, as well as research into enterprise strategies for restructuring or programs for restructuring.

2. Research into specific topics, such as development research into new products for enterprises, demonstration of programs for technical transformation or feasibility studies, and research into new technologies and new techniques.

3. Work in basic technology, such as formulation, revision, and supplement of criteria, standards, and technical specifications, or on S&T reporting.

4. Intellectual development in enterprises, as for example with the building of services, training of staff, and reeducation of engineers, or the translation of specialist and technical materials, writing and theorizing, and compiling teaching materials.

5. Work in consulting, advising, and investigative research to advise and aid current leading groups.

6. Taking on factory S&T commission work, or organization and leadership of science associations, or leadership of scholastic activities.

7. Be responsible for specialized technical work in higher level responsible departments, or transfer to schools, small to medium-sized enterprises, or town and township enterprises to take up technical development work.

8. Open up "third-line industries," and take part in their guidance.

To make the most of engineers and technicians in their 50's and to make the most of technical personnel in other age groups is not only without contradiction but is one and the same thing. Those who are today in their 40's will be those in their 50's in a few years, so if we take good care of this group, and use them to their fullest, we will not only be providing an encouraging and stable role for those in their 50's, but also for those currently in their 30's and 40's.

12586
CSO: 40082073

NATIONAL DEVELOPMENTS

AILING SCIENTIST CITED AS MODEL FOR OTHERS

OW291143 Beijing XINHUA in English 0908 GMT 29 Mar 86

[Text] Beijing, 29 Mar (XINHUA)--Scientific workers throughout China have been urged to practice the devotion to science and selfless hard work of a good geologist who is now seriously ill in the hospital. Peng Zhizhong, 53, an authority on crystal structure, was taken to a Beijing hospital last month for treatment for a serious illness.

On Friday, the State Science and Technology Commission and the Ministry of Geology and Mineral Resources issued a decision declaring that Peng had set a shining example for all scientific workers to follow. He had taken scientific research to new heights, worked hard, helped others and never sought personal fame or gain.

Peng is a National People's Congress delegate, chairman of the minerals and crystals committee of the Chinese Geological Society and professor at a Beijing geological education center attached to the Geology Ministry. He was also invited as an advisor to the International Society of Crystallography.

In 1984, scientific authorities praised him as being one of the country's most outstanding scientists.

He graduated from Qinghua University in 1952, and 5 years later became the first geologist in the world to define the complicated crystal structure of the mineral, prehnite. Five years after that, he was also first to determine the structure of astrophillite crystals.

Over the past 20 years, Peng and his laboratory team have discovered the crystal structures of more than 50 minerals. And with the help of other institutes, they have discovered and defined more than 30 new minerals.

His more recent work has been hailed by other geologists as having achieved "a breakthrough in the understanding of crystal structures," and his research findings have won two national prizes.

/9604
CSO: 4010/2013

NATIONAL DEVELOPMENTS

ELASTICITY IN ENTERPRISE'S ORGANIZATIONAL STRUCTURE URGED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S & T] in Chinese No 11, 15 Nov 85 pp 25-26

[Article by Li Hangsheng [2621 2635 3932] and Li Zhao [2621 6856]: "Changing Management Patterns To Employ a Generation of New People--On Elasticity in Controlling Organizational Structure of Enterprises"]

[Text] In his important speech at the national work conference on science and technology, Comrade Deng Xiaoping pointed out: "We must create an environment in which top-notch talented persons can display their talents." The key to creating this kind of environment in enterprises lies in elasticity in controlling the organizational structure. Elasticity in the organizational structure is formed by a synthesis of an enterprise's administration and management with its leaders' work style. In itself it is a dynamic environment. Therefore, the elastic control of the organizational structure is a topic worth studying.

From a look at the situation in our country's reform of the economic system, we see that a very important link in changing the management pattern is to employ a generation of new people. Employing a generation of new people means, in the final analysis, putting top-notch talented persons in the organization. This is precisely the purpose of controlling, in a planned way, the elasticity of the organizational structure. To illustrate with an example, currently many enterprises are changing from the production model to the production administration and development model. This change not only requires that the economic structure, product structure, as well as the organizational structure of the enterprise be changed, but also, what is more important, requires that the personnel makeup of the leading group be changed by selecting and training cadres who meet the demands of the "four modernizations." This change will bring a very great elasticity to the organization. For top-notch talented persons, this elasticity provides a fine environment. People will be full of confidence and hope in the interested and enterprising spirit of this environment.

Then, how is the initiative and elasticity of the organizational structure to be created and controlled? We think there are the following ways to do this.

1. Democratic Management The leaders must pay a good deal of attention to democratic management, actively encourage the participation by staff and workers in an enterprise's policy making, and give play to the role of the staff and workers as masters. Make everything known to them, give them full confidence, and give them full authority, so as to encourage top-notch talented persons to display their talents. This is the richest elasticity, and is the democratic pattern that most accords with the demands of the times.

2. The System of Inviting Applicants for a Job To put into effect the system of inviting talented persons inside and outside an enterprise to apply for jobs is an effective way of breaking the "tenure system," the "system of coattail influence," and the "network of connections." Then the enterprise is to conduct a comprehensive examination of the politics and ideology, management level, and professional ability of those who respond to the invitations. Doing this will not only be advantageous to the display of their talents, but also will be advantageous to the discovery of versatile persons. The most prominent feature of this practice is its strong controllability.

3. Probation System During the process of promoting cadres, particularly leading cadres, putting into practice a system of probation for a certain period of time will temper them in an environment in which they have functions and power, and in this period there will be training and examination of their overall capabilities. Those who meet the demands should be timely appointed and promoted, and should be entrusted with important tasks. Those who do not meet the demands can be sent back to their original units. By adopting this method of first putting them in posts and afterward appointing them, in the system it will do away with the force of habit in which cadres could only go up but not down, and in the organizational structure it will cause a high degree of elasticity.

4. Mobility of Talented Persons Mobility in itself implies a kind of elasticity. As for talented persons, if in one place they cannot display their special skill or knowledge, then they may change places. The enterprise must not tie people fast and make them appendages. Talented persons are the source of the greatest energy. Once we permit talented persons to be mobile, this will be equivalent to mobilizing a massive army. Reform will immediately be imbued with a lot of vitality, and enterprises will immediately be filled with a lot of energy.

Of course, there are also many practices, like the "cabinet-formation system," "system of appraising through discussion," "contract system," and so forth, that likewise can attain the goal of controlling the initiative and elasticity of the organizational structure. However, it must be pointed out that the elasticity of the organizational structure and the elasticity of management depend on each other, influence each other, and coexist. Therefore, while making use of management elasticity, we must effectively control the elasticity of the organizational structure, so that they both truly have the effect of discovering, uniting, and using talented persons.

Moreover, the elasticity of the organizational structure has an effectiveness for a given period of time, and we must make full use of the opportune time to create an environment that is advantageous for the display of the talents of

top-notch talented persons. If we cannot effectively and timely control the elasticity of the organizational structure, then even if we introduce new types of administrative and management methods and new types of organizational structure forms, it will be very difficult for our enterprises to have powerful leaders who possess the spirit of blazing new trails and the spirit of opening up new paths.

9727
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NATIONAL DEVELOPMENTS

INDUSTRIAL TECHNOLOGY DEVELOPMENTS DESCRIBED

Tianjin JISHU SHICHANG BAO in Chinese 28 Jan 86 p 1

[Text] During the period of the "Sixth 5-year Plan," technical development of China's industrial system and the dissemination of technical achievements began to get onto the track of development as a "coordinated process," where the improvement of economic results is at the center, where products are the head, and where absorption and assimilation are the focal points. From 1983 through 1985, a group of new products that had been successfully test developed and put into production have already begun to show results. According to incomplete statistics, these items have already earned 390 million yuan in profit, have saved the state 380 million yuan, 3.63 million tons of steel, 3,850 kg of silver, 3.01 million tons of oil, and have either saved or created nearly 90 million U.S. dollars in foreign exchange. The absorption and assimilation of imported technology has already begun. As for example the work of absorbing and assimilating the polymerization of 80 cubic meters of polyvinyl chloride as organized by the Ministry of Chemical Industries, which not only filled a domestic vacuum, but allowed China to become one of a few countries that can manufacture large scale polymers. At the same time, it provided the technology for manufacturing 33, 30, and 13.5 cubic meter polymers.

Forty projects for the dissemination of major new technologies included in the "Sixth 5-year Plan" have been basically completed, and 80 percent of the area has been used, which has produced remarkable results. Seventeen of the projects had economic results during the "Sixth 5-year Plan" totaling 100 million yuan. There were 7 projects among them with 500 million and more. As for example with the electric brush plating technology that has more than 3,000 pieces of power source equipment in use, for which more than 40 brush plating liquids have been developed and there are 1,500 tons of accumulated applications. Adopting and disseminating this technology has already generated and recovered a use value of 700 million yuan, and has saved 55 million U.S. dollars in foreign exchange. Hot spray painting technology has been broadly adopted by more than 600 units, for a generated and recovered use value of 1.3 billion yuan.

There has been definite progress in using microelectronics to transform machine tools. According to incomplete statistics from a portion of the provinces, cities, and autonomous regions, by the first half of 1985, 1,300

old machine tools had been refitted, finishing 3,000 palpable coordinates; in the aspect of expanding the fields of applications for microelectronics technology, by the end of 1984, 15 traditional industrial kiln furnaces were transformed, and in only the areas of energy savings and reduction of losses of steel from burning, annual economic results are 10 million yuan.

12586
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NATIONAL DEVELOPMENTS

BRIEFS

NEW COMPUTERIZED POST OFFICE FOR BEIJING CITY--Beijing, 15 Mar (XINHUA)--Work began on a computerized central post office at Qianmen in downtown Beijing today. The center will cover 66,000 square meters. Upon completion next year, it should be able to sort 12 billion items of mail per year, according to Liu Pingyuan, the city's deputy postmaster. Beijing handled 7.4 billion items last year, and this is expected to rise to 11 billion by 1990. At present, it has 420 post offices conducting business with other parts of China and 106 countries and regions all over the world. In addition to the new central post office, Liu said, the Municipal Government plans to build a general parking center for mail trucks and four district sorting centers. Meanwhile, several post offices will be modernized. [Text] [Beijing XINHUA in English 1840 GMT 15 Mar 86] /8309

COMPUTER, MICROELECTRONIC TECHNOLOGY DEVELOPED--Beijing, 4 Apr (XINHUA)--China now has an annual capacity to produce more than 54 million pieces of integrated circuits, including 2.1 million large-sized ones, according to the journal, ECONOMIC INFORMATION. China started its research on integrated circuits in 1964. There are now 17 major enterprises in the country engaged in research and production of integrated circuit. ECONOMIC INFORMATION noted that nearly 900 of China's integrated circuit products have reached international technological standards. Meanwhile, China has also attained an annual capacity of producing over 300 large, middle, or small-sized computers, the paper said. The country is also capable of turning out about 100 analog computers and 30,000 micro-computers every year. Its computer enterprises total 130, with 90,000 technicians and workers. The country has also succeeded in making large computers capable of processing 100 million instructions per second. In the meantime, robots have begun to be applied in China's industries. Nowadays, ECONOMIC INFORMATION said, computers have not only gone into factories, colleges, and high schools, but also into farms and primary schools. They are playing an increasingly important role in China's economic construction and national defense. ECONOMIC INFORMATION also highlighted China's development of telecommunications technology by mentioning the country's success in building communications and broadcasting satellites, and satellite ground stations. It also said China has established nearly 100 optical fiber communications systems. [Text] [Beijing XINHUA in English 1841 GMT 4 Apr 86] /8309

LIAONING ELECTRONICS INDUSTRY--During the Sixth Five-Year Plan period, electronics industrial enterprises in Liaoning Province created 5.1 billion yuan in output value, earned 350 million yuan in profits, and delivered 200 million yuan in profits and taxes. The 1985 total output value of the electronics industry came to 1.75 billion yuan, a 140-percent increase over 1980, and overfulfilling the target set by the Sixth Five-Year Plan by 850 million yuan. In 1985 electronics industrial enterprises throughout the province earned 170 million yuan of profits, a 5.4-fold increase over 1980 and showing a yearly average increase of 44.9 percent. From 1981 to 1985, 12 products turned out by the provincial electronics industrial enterprises have won state prizes for good quality, 24 products have won prizes from ministries, and 104 products have won provincial prizes. From 1981 to 1985 a total of 700 new electronics industrial products were produced. In 1985, the output value from new products was 400 million yuan and profits earned from such products reached 42 million yuan. [Summary] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 21 Jan 86 SK] /8309

FAMILY PLANNING WORK--Beijing, 22 Mar (XINHUA)--China's family planning work is making progress at the grassroots level. Currently, among the nation's 2,300-plus counties, some 1,700 have set up grassroots work stations for propaganda work on family planning and birth control guidance. Training of personnel engaged in family planning work has been intensified with a view to elevating their quality. [Summary] [Beijing XINHUA Domestic Service in Chinese 1216 GMT 22 Mar 86 OW] /8309

CSO: 4008/1051

PHYSICAL SCIENCES

SPECTRAL SIGNATURE OF SEA WATER IN BOHAI BAY ANALYZED

Beijing HAIYANG KEXUE [MARINE SCIENCES] in Chinese Vol 9 No 2, 9 Mar 85 pp 10-13

[Article by Ping Zhongliang [1627 0112 5328], Oceanography Institute, Chinese Academy of Sciences]*

[Text] I. Introduction

To extract information about the oceans from the data gathered by remote-sensing is a key issue in the application of marine remote-sensing.

There are many approaches and models for extracting marine information from remote-sensing data. Each has its own advantages and drawbacks. Judged by published articles on remote-sensing, the mathematical statistics model is by far the most frequently used. Its advantages are that it is simpler operationally and is more accurate. Its drawback lies in its great limitation. It gives correct results only at certain ocean regions and at specific atmospheric conditions and flight altitudes. In the article "Numerical Analysis of the Spectral Signature of the Sea Water in Bohai Bay,"[1] the author used exactly the same mathematical statistics method and linear regression equation as used by R.W. Johnson (1978, 1979).

To improve the correlation between the values calculated from remote-sensing data and the values measured on site, that is to improve the reliability of the oceanographic data calculated from remote-sensing data, a new approach--complex correlation analysis--for the derivation of regression equation is described in this article. The calculations show that the mathematical model derived from the complex correlation analysis approach gives better results than that derived from R.W. Johnson's approach--the simple correlation method (or single correlation method in some mathematical statistics texts).

R.W. Johnson uses the successive regression analysis to select those dependent variables (the reflectance of sea water at certain wavelengths) that have higher correlation coefficients with the independent variables (the chlorophyll-a concentration and the suspended sediment content) and to

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establish their mathematical correlations. However, the dependent variable (the reflectance of sea water) is not associated only with one independent variable (the chlorophyll-a concentration of the suspended sediment content), but with two or more of them (chlorophyll, sediment, and other dissolved or suspended materials). Therefore, we have used the complex correlation analysis approach.

In this article, the original data from the paper "The Numerical Analysis of the Spectral Signature of the Sea Water in Bohai Bay"[1] are used and certain explanations and elaborations that are called for with regard to those questions not fully addressed or not addressed at all in that paper are made. Thus, this article is a continuation, a supplement and an expansion of that paper.

II. Methods

To explain the complex correlation approach and to make comparison with the simple correlation approach, a brief review of the simple correlation method is in order.

First, the aerially-measured reflectance curves of sea water at the eight sights in Bohai Bay are digitalized, i.e. each curve is partitioned into 20-millimicron-wide sections and the reflectance for each wave section is measured, which is divided by the reflection of white surface for that particular wavelength and then multiplied by the reflectance of the white surface to obtain the reflectance data of each wave section for all sites (see Table 1).

Then, the correlation coefficients of the sea water's reflectance at all eight sites with each oceanographic parameter (e.g. the chlorophyll-a concentration, the suspended sediment content, and the chroma of water) are calculated section by section. For each oceanographic parameter, the reflectance of the section with the best correlation coefficient or sections with better correlation coefficients are used to establish its regression equation, hence the regression equations for all oceanographic parameters are obtained.

In the complex correlation analysis, the complex correlation coefficients of sea water's reflectance with two or more oceanographic parameters (but mainly with the two parameters of chlorophyll and suspended sediment) are calculated section by section. Among the reflectances with better complex correlation coefficients, two are chosen to establish the regression equation for each oceanographic parameter. The detailed procedures are as follows:

1. The relationship between the two independent variables (chlorophyll-a concentration and suspended sediment content) and the dependent variable (sea water's reflectance) is expressed by a binary linear equation:

$$Y = A_0 + A_1x_1 + A_2x_2 \qquad (1)$$

Table 1. The Measured Oceanographic Data and the Reflectance of Sea Water at Each Site

Site	11A	11B	11C	11D	12A	12B	12C	12D
Chlorophyll-a (mg/m^3)	2.287	1.987	0.927	1.613	2.627	1.687	0.976	2.056
Suspended sediment (mg/l)	160	40	80	40	110	140	160	60
Chroma of water (color grade)	21	15	15	20	21	19	14	19
Wavelength (mμ)	Reflectance of sea water (percent)							
460	15.13	14.81	14.19	14.83	15.83	16.26	15.27	14.48
480	15.62	15.26	14.79	15.57	16.71	17.03	17.45	14.96
500	19.17	16.26	16.72	17.07	18.53	18.47	19.77	15.99
520	18.12	17.52	17.64	18.38	19.37	19.50	20.03	17.39
540	20.32	19.46	19.01	20.30	21.92	21.88	23.48	17.87
550	22.16	20.52	20.16	21.90	22.53	22.96	24.42	19.47
560	23.03	22.07	20.75	23.87	24.40	24.72	25.85	20.96
580	24.34	23.53	23.00	25.67	27.43	27.35	28.91	23.58
600	25.78	23.67	23.11	25.67	28.16	28.35	28.59	23.83
620	25.38	21.55	21.25	23.59	27.01	27.18	24.87	21.73
640	24.83	20.58	20.43	22.81	27.10	27.27	23.80	20.81
660	24.06	19.08	19.04	22.80	26.74	27.32	22.02	18.87
680	24.12	18.81	18.19	23.36	26.29	27.22	20.16	18.20
700	21.80	16.57	16.75	21.35	24.29	24.60	17.56	16.79
720	15.92	11.69	12.15	13.17	19.63	20.13	13.03	12.71
740	13.57	6.58	7.21	7.50	11.47	12.23	6.62	6.75
760	11.11	5.20	6.87	5.82	8.96	9.41	5.61	5.50
780	10.82	5.09	6.80	6.63	8.58	8.96	5.31	5.10

Y Reflectance of wavelength λ;
x_1 Chlorophyll-a concentration;
x_2 Suspended sediment content;

A_0, A_1, A_2 Regression coefficients at wavelength λ.

2. The estimated values a_0, a_1, and a_2 of the coefficients A_0, A_1, and A_2 at wavelength λ are calculated by the least square method (see Table 2). The estimated values a_1 and a_2 reflect, respectively, the relationship of the sea water's reflectance with the chlorophyll-a concentration and the suspended sediment content, which are termed the regression coefficients of the dependent variable y with respect to the independent variables x_1 and x_2.

3. The measured data (the chlorophyll-a concentration and the suspended sediment content) and the established values a_0, a_1, and a_2 of the coefficients A_0, A_1, and A_2 at wavelength λ are fed into the regression equation:

Table 2. Regression Coefficients at Each Wavelength

Wavelength (mμ)	a_0	a_1	a_2
460	13.597715	0.398665	0.0083856
480	14.783084	- 0.0661823	0.0132496
500	15.285051	- 0.0214335	0.0263197
520	18.032524	- 0.5166667	0.0157970
540	18.988276	- 0.3971048	0.0236277
550	20.735323	- 0.6033012	0.0220790
560	21.337911	- 0.0367382	0.0[illegible]4695
580	24.596179	0.0466005	- 0.0047624
600	22.340951	0.3648049	0.0306403
620	18.299123	1.422945	0.0347081
640	23.533553	- 2.156379	0.0393367
660	14.477046	2.240043	0.0426245
680	13.359734	2.839128	0.0385133
700	11.829807	2.837489	0.0327535
720	6.0308299	2.792556	0.0403168
740	0.1436131	2.706003	0.0427159
760	1.0198433	1.702360	0.0344945
780	1.0643589	1.601279	0.0330277

$$Y_{\lambda cal} = a_1 + a_1x_1 + a_2x_2 \qquad (2)$$

The calculated values, $R_{\lambda cal}$'s, of sea water's reflectance for each wave section at all sites are obtained accordingly.

4. The correlation coefficient r between the measured and the calculated reflectance of sea water is calculated for each wave section. It is verified[4] that the calculated r's are the complex correlation coefficients of two independent variables and a dependent variable.

5. R_{500} and R_{740}, the reflectances measured at the wavelengths with the greatest complex correlation coefficient r, and the measured oceanographic data are used for complex regression operation and the following complex regression equations, having R_{500} and R_{740} as independent variables and an oceanographic parameter as dependent variable, are obtained:

Chlorophyll-a (mg/m^3) = $3.871 - 20.377R_{500} + 16.849R_{740}$ (3)

Suspended sediment (mg/m^3) = $-377.082 + 2429.82R_{[illegible]} + 455.006R_{740}$ (4)

Chroma of water = $24.096 - 80.792R_{500} + 91.656R_{740}$ (Color grade) (5)

where R_{500} and R_{740} are the reflectances of sea water at the wavelengths of 500 and 740 mμ.

III. Comparison of the Correlations

The calculated values for each oceanographic parameter at all sites were obtained by feeding the remote-sensing data of R_{500} and R_{740} at each site into the above regression equations for chlorophyll-a concentration, suspended sediment content, and chroma of water. The correlation coefficients of the calculated and the measured values for each parameter were then calculated. It can be clearly seen from these calculations that the complex correlation approach gives better results than the simple correlation complex. For comparison, the correlation coefficients calculated by both methods are listed in Table 3.

Table 3. The Correlation Coefficients of the Calculated and Measured Values by the Simple and Complex Correlation Methods

Oceanographic parameter	Simple correlation method	Complex correlation method
Chlorophyll-a concentration	0.67	0.68
Suspended sediment content	0.73	0.91
Chroma of water	0.70	0.78

IV. Comparison of the Confidence

To find out the reliability of the oceanographic parameters calculated by using mathematical models, i.e., the parameters predicted by using remote-sensing data, the correlation coefficients were fed into the equation $F = \frac{r^2}{1 - r^2} (n - 2)$ to get the statistical quantities, F values. The confidence of the calculated values for each oceanographic parameter were figured out from chart[3] (see Table 4). It can be seen from Table 4 that the complex correlation approach gives remarkable improvement in the confidence for that of the chlorophyll-a concentration is also improved, though not as noticeable.

Table 4. The Confidence of the Calculated Values by Simple and Complex Correlation Methods

Oceanographic parameter	Simple correlation method	Complex correlation method
Chlorophyll-a concentration	0.90	0.90
Suspended sediment content	0.95	0.99
Chroma of water	0.90	0.95

V. Discussions

1. As described earlier, the reflectance of sea water is dependent on the algae (carriers of chlorophylls) and the suspended sediment content, and can be expressed by the equation $Y = a_0 + a_1x_1 + A_2x_2$. Reflectance is the combined result of the interaction of light with chlorophylls and suspended sediments (besides water itself). The reflectances at certain wavelengths such as 480 and 520 mμ within the blue-green region have larger simple correlation coefficients with the chlorophyll-a concentration whereas the reflectance at 500 mμ smaller. It appears that there are better correlations of the chlorophyll-a concentration with the reflectances at 480 and 520 mμ than with that at 500 mμ. But in fact this is not necessarily true, because the interaction with sediments is not taken into consideration. When the contribution of sediments is included, the correlations of the reflectances at 480 and 520 mμ are no better than at 500 mμ. Therefore, the contribution of sediment (chlorophyll-a) should be considered at the same time the contribution of chlorophyll-a (sediment) is being considered, i.e. the combined contribution of chlorophyll-a and sediments to the reflectance should be considered. Only the mathematical correlation established on this basis (i.e. the selection of those reflectances with the largest complex correlation coefficients can give a broader and more accurate account of the relationship between an independent variable (chlorophyll-a or sediment) and a dependent one (reflectance). Therefore, the complex correlation coefficients not only reflect the closeness of the overall relationship between two independent variables and a dependent variable but also reflect, more thoroughly and accurately, the closeness of the relationship between an independent variable and a dependent variable. This is why the complex correlation approach is superior to the simple correlation approach.

2. As shown in Table 2, the a_1 values are all negative at the blue-green region of the spectrum (480-560 mμ) and all positive at the red region. The increase in chlorophyll-a concentration lowers the reflectances within the blue-green region but raises those within the red. This is the spectral effect of the chlorophylls in such areas with high suspended sediment content as the Bohai Bay, which is different from that of the chlorophylls in clear sea water. This provides a theoretical basis for the determination of chlorophyll concentration by various multiple-wavelength scanners on airplanes or satellites, including the broader spectrum, multiple-wavelength scanner on the land satellites. With higher suspended sediment content, the signals are stronger and easier to pick up.

3. To raise the accuracy of the oceanographic data generated from the remote-sensing data, i.e. to improve the correlation coefficients of the remote-sensing data and the measured data, the accuracy of the remote-sensing data and the measured data has to be improved and the number of site increased (i.e. to increase the number of sample) on the one hand, and the mathematical models that more accurately describe the physical correlation between the remote-sensing data and the measured data must be established through various approaches on the other. It is obvious from the calculation results that the complex correlation method is superior to the simple

correlation method but not necessarily the best one. Others such as partial correlation (net correlation in some texts) and nonlinear regression need to be examined to see if they give better results.

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12922/9365
CSO: 4008/1039

APPLIED SCIENCES

FIRST ARC-WELDING ROBOT PASSES CERTIFICATION

Harbin HEILONGJIANG RIBAO in Chinese 22 Feb 86 p 1

[Text] The "Huayu-1," China's first arc-welding robot was certified by the Ministry of Space Industry in Harbin on 21 February. The robot was jointly developed by the Harbin Industrial College and the State-operated Fenghua Machinery Factory.

Shown above are R&D personnel running debugging tests on the "Huayu-1" arc-welding robot.

This robot, which weighs some 750 kilograms, stands 1.6 meters high and its main mechanical arm is 60 centimeters long and its small arm measures 80 centimeters in length. The entire mechanism consists of five movable links: the "waist," the large and small arms, and the wrist elevation and rotation mechanisms, capable of moving up and down and left and right; the waist can rotate 240 degrees. The robot's three major components are the "body," the control system, and the welding system. Three different kinds of welding may be employed. Experts hold that the robot's technological sophistication proves that we have approached or even surpassed international standards for comparable products. During the appraisal, "Huayu-1" demonstrated its ability to "see," "hear," and "feel." Imitating the human eye, it automatically aims at the welding seam; responding to the commands of operator, it flexes its mechanical arm which can adjust the elevation and direction of movement of the welding torch. The R&D personnel indicated that these three capabilities of the arc-welding robot are the prime features of a second-generation robot.

/8309
CSO: 4008/55

STATUS OF ROBOT DEVELOPMENT REVIEWED

Tianjin TIANJIN RIBAO in Chinese 3 Feb 86 p 3

[Article by XINHUASHE reporter Dai Yaping [2071 0068 1627]: "Prospects of China's Robot Development--Interview With Jiang Xinsong [5592 2450 2646], director of Shenyang Institute of Automation, Chinese Academy of Sciences"]

[Text] Director Jiang Xinsong has been shuttling back and forth between Beijing, Dalian, and Shenyang. On 14 December last year, a few days after the successful preliminary test of China's first underwater robot developed by his institute, he flew to Beijing to sign an agreement with an American company on importing technology for the production of medium-sized underwater robots. That done, he went north to Dalian to take part in the underwater test of the "Hairen-1." A month later, he again returned to Beijing to attend the annual meeting of the Chinese Academy of Sciences.

During a recess at the meeting, the reporter interviewed him. He talked about nothing but robots.

To make things clear from the very beginning, Jiang Xinsong pointed out that many Chinese have a misconception that a robot must look like a human being. This is because the word robot is wrongly translated as "jiqiren" [mechanical man].

The name "robot" is used in all other countries of the world, and China is the only exception. Tracing to its source, the term appeared for the first time in 1932 in a satirical comedy written by a Czech writer, in which a man-made mechanical slave was named "Robot." And the name has been used by scientists to this day. An accurate definition of a "robot" is: a versatile mechanical device which can be programmed to function at will and which can perform man-like movements. In China, the term "robot" was first translated as "jiqiren." Many scientists have raised objections, but because the term "jiqiren" has already been firmly implanted in people's minds, it is difficult to change and is still being used.

Robot technology has developed rapidly in the world in the past 20 years. By the early 1980's, the number of robots in the world had risen to 28,000, nearly half of which were in Japan. Robot technology is also highly developed in the United States, West Germany, Sweden, Britain, and France. Not long

ago, a U.S. underwater robot discovered the "Titanic" on the bottom of the Atlantic Ocean, thus giving wide publicity to robots. Based on the current status and future trend of worldwide robotics development, Jiang Xinsong predicts that tremendous progress in robot technology will be made in various countries and a "robot mania" will sweep through the world in this century.

Robotics research formally began in China in the 1970's, but progress has been slow. Thus far, we have produced 2,000 mechanical arms of various types. There are less than 10 second-generation robots, and a robot industry has yet to be formed. There are still doubts and misgivings in society as to whether robots will compete with people for "jobs."

Jiang Xinsong thought that even though China has a large population and plenty of labor, there is still much room for robots to work. In occupations which pose a threat to people's health and lives, such as the coal mining, chemical, pharmaceutical, atomic, electroplating, and metallurgical industries, robots are urgently needed to do the work of men. In such work as offshore petroleum exploration, oceanic studies, dam repair and maintenance, lifesaving at sea, underwater salvage and ocean aquaculture, robots can dive to depths impossible for divers to reach to perform various kinds of underwater tasks. From now on, robots will play an increasingly greater role.

Jiang Xinsong told the reporter that a "Chinese robot demonstration project," which combines robot research, development, and production into one integrated process, is under construction in Shenyang. At the same time, it has been learned that robot development is included as a major scientific and technological project in the Seventh Five-Year Plan. This means that China's robot industry has begun to move forward.

On future prospects of robot development in China, Jiang Xinsong said that the Chinese Academy of Sciences will pay attention to the development of second-generation and third-generation (intelligent) robots, and that in the near future it will put the emphasis on developing underwater robots, mining robots, and robots for special environments. At the same time, it will actively bring in advanced foreign technology to begin serial production of medium-sized underwater robots within this year. In the next few years, heavy-duty underwater robots of the "Hairen" series and light-duty underwater robots of the Goldfish series will be turned out one by one and will then be put into serial production. Thus robots will display their abilities in wide fields.

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JPRS-CST-86-015
25 April 1986

MATHEMATICAL MODEL FOR FORECASTING AND CORRECTION METHOD

Beijing BEIJING DAXUE XUEBAO (ZIRAN KEXUE BAN) [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINESIS] in Chinese No 5, Sep 85 pp 20-24

[English abstract of article by Wang Renguan [3076 0088 1351] of the Department of Mathematics, Beijing University]

[Text] The forecasting and correction method is a new statistical quality control method given by Taguchi. It is more efficient economically than is Shewhart's control chart. In this paper we give a general mathematical model for Taguchi's F-C method and also make some improvements. (Paper received on 5 January 1983.)

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ANALYSIS ERROR IN MINORITY CARRIER BULK GENERATION LIFETIME DETERMINED BY ZERBST'S C-t METHOD

Beijing BEIJING DAXUE XUEBAO (ZIRAN KEXUE BAN) [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINESIS] in Chinese No 5, Sep 85 pp 84-89

[English abstract of article by Xu Mingzhen [6079 6900 4176], et al., of the Department of Computer Science and Technology, Beijing University]

[Text] An error analysis of the Zerbst C-t method for the determination of the minority carrier bulk generation lifetime has been performed. The results show that a major effect is produced by the measurement error in the capacitance and that the effect of time errors (≤10 percent) is negligible. Other causes affecting lifetime measurement are also discussed. (Paper received on 2 February 1985).

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9717
CSO: 4009/1031

IRRADIATION SURVEILLANCE AND EMBRITTLEMENT EVALUATION OF LWR PRESSURE VESSEL MATERIALS

Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 6 No 6, Dec 85 pp 10-16, 71

[English abstract of article by Wan Dehua [8001 1795 5478]]

[Text] This paper describes the function, standards and method of embrittlement evaluation of irradiation surveillance of LWR pressure vessel materials. The point of view of modern irradiation surveillance technology is given, and according to the current conditions of China, a proposal is presented to set up a reliable and effective irradiation surveillance program of nuclear plants.

WESTINGHOUSE NEXT GENERATION OF PWR FUEL DESIGN--VANTAGE 5

Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 6 No 6, Dec 85 pp 17-24

[English abstract of article by He Weidong [0735 5898 2639]]

[Text] Westinghouse Electric Corporation, the world's leading designer of PWR fuel assemblies, has founded the PWR fuel development system in the Western countries. Following the development of an Optimized 17 x 17 Fuel Assembly (OFA) design after completion of the so-called generation 6 fuel design, it is carrying out a new program to form the latest generation 17 x 17 fuel design, VANTAGE 5, based on OFA. The five salient features of VANTAGE 5, i.e., integral fuel burnable absorbers, intermediate flow mixer grids, axial blankets, increased discharge burnup and reconstitutable top nozzle, enable the fuel assembly to greatly improve its own performance and economic benefits. Such a state-of-art design of VANTAGE 5 will be completed soon. The experiences of Westinghouse in that field are noteworthy.

EXPERIMENTS OF ALL POWER LOSE IN THE HFETR AND THEORETICAL ANALYSIS

Chengdu HE DONGLI GONG-CHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 6 No 6, Dec 85 pp 25-29, 60

[English abstract of article by Wang Jiafeng [3769 1367 0023], et al.]

[Text] This paper summarizes experiment data of all power lose in the HFETR, and compares the experimental results with the calculated values (the transient flow and temperature distribution in the fuel subassembly after all power lose). It is indicated that the good agreement between them (departure from each other less than 4 percent), which shows that the theoretical analysis is correct, proves that the HFETR is safe during all power lose.

SEVERAL PROBLEMS IN DESIGN AND TECHNOLOGY OF ZIRCALOY SPACER GRIDS USED IN PWR FUEL ASSEMBLIES

Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 6 No 6, Dec 85 pp 53-60

[English abstract of article by Zhang Shiquan [1728 0013 2938]]

[Text] The change in spacer grid material from a Ni-base alloy to Zircaloy is economical. This paper describes Zircaloy spacer grid classifications, the advantages and features of its structural design, and problems in shaping and welding which are worthy of note. It is clearly pointed out that the Zircaloy spacer grid is one of the important characteristics of the new PWR fuel assembly.

OPTIMIZATION OF THE NEUTRON ALBEDO BOUNDARY CONDITION IN THE ON-LINE CORE SIMULATOR

Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 6 No 6, Dec 85 pp 72-76

[English abstract of article by Li Guangjun [2621 1639 6874], et al.]

[Text] The on-line core simulator is an important software part of the reactor core power distribution prediction system. If the neutron albedo condition is adopted, the time response of the core simulator can be improved. However, so far there have been no good methods for calculating neutron albedos. The "Powell" optimization method is adopted in this paper. It optimally adjusts the reflector albedos on every boundary of the core to the optimal direction, thereby gaining the best coincidence between the calculated and measured neutron flux. If the on-line core simulator is added to this optimization program, it can be adaptable. This paper describes the on-line core simulator, the "Powell" method for optimizing albedo and the calculated results.

9717
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Physics

THE CONJUGATED SYSTEM AND SEMICONDUCTIVE BOND IN BINARY COMPOUND CRYSTALS OF AB TYPE

Beijing BEIJING DAXUE XUEBAO (ZIRAN KEXUE BAN) [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINESIS] in Chinese No 5, Sep 85 pp 48-53

[English abstract of article by Zhao Shen [6392 3234] and Zhao Yuan [6392 3293] of the Department of Technical Physics, Beijing University]

[Text] In the present paper the conjugated bond network formed by two kinds of component atoms of alternate coordination in an AB type binary compound has been treated by the LCBO MO method. The following results have been obtained and found to be in agreement with the experiments: if the conjugated σ or π bond is non-polar, the conjugated bond is a metallic bond and the binary compound is a conductor; if the conjugated σ or π bond is polar, the conjugated bond is a semi-conductive bond and the binary compound is a semi-conductor or an insulator. (Paper received 12 July 1983.)

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STUDY OF THE CHEMICAL BOND IN CRYSTALS. I. ELEMENTARY SUBSTANCES AND COMPOUNDS OF AB TYPE

Beijing BEIJING DAXUE XUEBAO (ZIRAN KEXUE BAN) [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINESIS] in Chinese No 5, Sep 85 pp 54-62

[English abstract of article by Zhao Shen [6392 3234] and Zhao Yuan [6392 3293] of the Department of Technical Physics, Beijing University]

[Text] In this work the electronic structure in crystals of elementary substances and compounds of the AB type is treated by the LCBO MO method. In addition, the nature of the bond and the relationships of the bond types in these crystals are discussed. (Paper received on 14 March 1983.)

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Polymers and Polymerization

SYNTHESIS OF METHYLSILANOL-TERMINATED SILICONE RESINS AND THEIR THERMOSETTING PROPERTIES

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 325-330

[English abstract of article by Zhang Rongben [1728 2827 2609], Bei Jianzhong [6296 1696 0022] and Chen Bushi [7115 2975 2514] of the Institute of Chemistry, Chinese Academy of Sciences, Beijing; and Ye Limei [0673 5461 2734] of Zhongshan University, Guangzhou]

[Text] 1,1,5,5-tetrachloro-1,5-dimethyl-3, 3-diphenyltrisiloxane (A) and 1,1,5,5-tetramethyl-1,5-dichloro-3,3-diphenyltrisiloxane (B) were obtained by the reactions of methyltrichlorosilane and dimethyldichlorosilane with diphenyldichlorosilane, respectively. The whole methylsilanol-terminated silicone resin (I) was prepared from (A) and (B) in proper proportion. Also, two other types of methylsilanol-terminated silicone resins (II) and (III) were produced by the reactions of methyltrichlorosilane and methyltriacetoxy-silane, respectively, with the phenylsilanol-terminated silicone resins prepared by the usual cohydrolysis method. The methylsilanol-terminated silicone resins (I, II, III) can be cured more than two times faster than the phenylsilanol-terminated silicone resins prepared by the usual cohydrolysis method. (Paper received on 31 May 1983.)

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THE CURING CHARACTERISTICS OF BUTYL GLYCIDYL-4, 5-EPOXYCYCLOHEXANE-1, 2-DICARBOXYLATE WITH m-PHENYLENE DIAMINE

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 331-336

[English abstract of article by Huang Jifu [7806 0679 3940] and Zhang Baolong [1728 0202 7893], et al., of the Department of Chemistry, Nankai University, Tianjin; and Yang Biao [2799 7374], et al., of Tianjin Institute of Synthetic Materials, Tianjin]

[Text] The curing characteristics of butyl glycidyl-4,5-epoxycyclohexane-1, 2-dicarboxylate with m-PDA have been studied by TBA, DSC and IR. It is found that the curing process of the curing system proceeds in two stages, and the apparent activation energy is 13.9 kcal/mol in the temperature range from 100 to 160°C and 16.6 kcal/mol/mol from 160 to 240°C. Due to the lower reactivity of the cycloaliphatic epoxy ring in the molecule, the sample storage life of about 80 days is predicted based on extrapolation of the experimental data. (Paper received on 18 July 1983.)

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SYNTHESES OF MACRO-POROUS CHELATE RESINS OF POLYVINYLBENZYLTHIOUREA AND THEIR CHELATE PROPERTIES FOR Au^{3+}

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 355-360

[English abstract of article by Chen Yiyong [7115 5030 6978], Hua Fang [5478 2397] and Wu Xiaobin [0702 1420 1755] of the Department of Chemistry, Hangzhou University, Hangzhou]

[Text] Macro-porous chelate resins of polyvinylbenzylthiourea (or thiourea resin TUR) with high adsorption capacity for Au^{3+} have been prepared. After swelling in 1,4-dioxane, the macro-porous crosslinked chloromethylated polystyrene beads were treated with saturated alcoholic thiourea solution, obtaining TUR with 98.8 percent of the functional group. The adsorption capacity of TUR for Au^{3+} is equal to 819 mg Au^{3+}/g resin (4.16 mmol Au^{3+}/g resin), and under the best conditions it can reach 920 mg Au^{3+}/g resin.

In a polymeric complex the chelate mole ratio of $Au^{3+}/-S-C{<}^{NH}_{NH_2^+Cl^-}$ approaches 1. The influence of pH on the percentage of adsorption for Au^{3+} has been investigated. The adsorption rates of TUR for Au^{3+} were determined by means of the static state method and the column method. The TUR structure was confirmed by IR-spectra and elemental analysis. The resin can be used in recovering gold from the wastewater of the gold electroplating industry, with Au recovery of $\geq$95.7 percent and 99.8 percent Au purity. (Paper received on 13 August 1983.)

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SUPERMOLECULAR STRUCTURES AND CRYSTALLIZATION BEHAVIORS OF POLYTETRAFLUORO-ETHYLENE BY RADIATION-INDUCED GRAFTING

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 367-371

[English abstract of article by Liang Shuxiang [2733 1859 3276] and Zhou Shiyi [0719 1709 3015] of Chenguang Institute of Chemical Industry, Ministry of Chemical Industry, Fushun, Sichuan]

[Text] Supermolecular structures and crystallization behaviors of the gamma-radiation induced graft copolymerization of styrene (St)-acrylic acid (AA) to polytetrafluoroethylene were investigated with an electron-optical microscope and X-ray diffraction. It was shown that the morphology of crystals obtained changed regularly with an increase in graft dose.

Four kinds of typical structure morphology (linear structure, graft network, ladder-type network, cross-linked network) were observed from the graft copolymer layer. It was demonstrated that the grafted chain aligned perpendicular to the surface films.

The results obtained from X-ray diffraction showed that a change in structure occurs; the macromolecular crystallinity decreases and the crystal size becomes smaller. (Paper received on 8 August 1983.)

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A NEW POLYMER SUPPORTED CATALYST--A COMPLEX OF POLYSTYRENE-TITANIUM TETRACHLORIDE

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 376-379

[English abstract of article by Ran Ruicheng [0373 3843 2052], et al., of the Department of Chemistry, Beijing University, Beijing]

[Text] Polystyrene, cross-linked with 4 percent divinylbenzene, is combined with $TiCl_4$ in CS_2 to form a stable complex containing 20.3 percent chlorine. The $TiCl_4$ complexed in polystyrene is resistant to water and can be stored in air at least one year. The complex is a strong solid Lewis acid and can be used to catalyze a lot of organic synthesis reactions in high yield, such as estericatlons, acetal formations, ketogenesis and the Friedel-Crafts alkylations. The complex is also a good catalyst for polymerization of α-methyl styrene. (Paper received on 3 November 1983.)

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NEW EXPRESSION FUNCTIONS FOR THE X-RAY DIFFRACTION PROFILE OF AMORPHOUS POLYPHENYLENE SULFIDE

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 5, Oct 85 pp 380-383

[English abstract of article by He Guoren [0419 0948 0088] and Zeng Hanmin [2582 3352 3046] of the Institute of Polymer Science, Zhongshan University, Guangzhou; and Han Futian [7281 3940 3944], et al., of the Guangdong Testing and Analysis Research Institute, Guangzhou]

[Text] Two new expression functions for the X-ray diffraction profile of both crystalline and amorphous polyphenylene sulfide (PPS) are proposed:

$$\left.\begin{aligned} Y &= 2^{-Q}\cdot \sin f\cdot A + (1-\sin f)A/(1+Q)\\ Q &= [(X-P)^2/(4P)]\cdot \operatorname{expexp}(aX+b)\\ a &= [\ln(V_2/V_1)]/(W_1+W_2)\\ b &= [\ln(V_1\cdot V_2) - a(2P - W_1 + W_2)]/2\\ V_1 &= \ln(4P/W_1^2) \qquad V_2 = \ln(4P/W_2^2) \end{aligned}\right\} \quad (1)$$

and

$$\left.\begin{aligned} Y &= 2^{-Q}\cdot \sin f\cdot A + (1-\sin f)A/(1+Q)\\ Q &= [(S-P)/P]^2\cdot \operatorname{expexp}(aS+b)\\ a &= [\ln(V_2/V_1)]/(W_1+W_2)\\ b &= [\ln(V_1\cdot V_2) - a(2P - W_1 + W_2)]/2\\ V_1 &= 2\cdot\ln(P/W_1^2) \qquad V_2 = 2\cdot\ln(P/W_2^2) \end{aligned}\right\} \quad (2)$$

where X is the diffraction angle, Y the diffraction intensity at X, W_1 and W_2 the left width and right width at half height, P the maximum position, A the peak height, and f the shape factor. $S = \sin\theta/\lambda$, (λ is the X-ray wavelength). Function (1) is suitable for profiles plotted against diffraction angle X, while function (2) is suitable for profiles plotted against S. The limitation to the range of applicable diffraction angle, which is inherent to the old expression functions reported in the literature, has been eliminated in these two functions. (Paper received on 6 December 1983.)

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Semiconductors

STUDY OF THIN SiO FILMS SYNTHESIZED BY HIGH DOSE AND LOW ENERGY OXYGEN ION IMPLANTATION INTO SILICON

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 584-589

[English abstract of article by Wang Yong [3769 0516], Li Weizhong [2621 4850 0022] and Li Zhijian [2621 1807 1017] of the Institute of Microelectronics, Qinghua University]

[Text] The conditions for synthesizing surface SiO_2 films by high dose and low energy oxygen ion implantation into silicon were investigated by AES, XPS, IRS, ellipsometry and I-V measurements. The dielectric strength and etch rate of the film were also inspected. In addition, the quality of the silicon crystal underneath the SiO_2 films and the surface states of the Si/SiO_2 interface were studied by TEM and C-V measurements. The experimental results showed that the uniform SiO_2 films could be synthesized under proper implantation and annealing conditions.

The electrical properties of the synthesized SiO_2 films nearly approach those of thermal oxidized SiO_2 films.

H_2^+ ion implantation into the Si/SiO_2 interface improves the characteristics of surface states considerably. (Paper received on 12 February 1985.)

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BEHAVIOR OF STRIPE DH SEMICONDUCTOR LASER UNDER STEP AND SINE CURRENT MODULATION

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 590-601

[English abstract of article by Wang Shouwu [3769 1344 2976] and Wang Zhongming [3769 0112 2494] of the Institute of Semiconductors, Chinese Academy of Sciences]

[Text] Self-consistent solutions of the field equation and rate equations of photon density and carrier concentration are obtained by means of a numerical calculation method. Using the self-consistent solutions we found: 1. When the photon density and interaction of the light with the carrier in the cavity are strong enough, a certain kind of self-sustained pulse will occur under the applied step current. 2. In the case of sine current modulation, the light output deformation will appear with high modulation frequency, and the light intensity distribution will change with the modulation current, thus causing the phase difference of the light output at different space positions. (Paper received on 8 January 1985.)

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A ROUTER FOR CMOS GATE ARRAY

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 602-610

[English abstract of article by Zhang Qinhai [1728 2953 3189] and Tang Pushan [0781 3877 1472] of the Department of Electrical Engineering, Fudan University]

[Text] This paper deals with the single layer of aluminum routing technology for CMOS gate array. The main difficulties of routing are as follows:
1) Since the wiring area is fixed, local wire congestion is likely to occur which may cause some of the nets to be unroutable;
2) Most of the terminals must be introduced to polysilicon, however, two or more terminals from different nets should not be assigned to one polysilicon.

In order to get a high quality routing, first a modified Kruskal's spanning tree algorithm is used to find an initial global routing for each net; next, according to the linear programming theory, the optimum distribution of all the terminals on the polysilicon array is obtained; then a sub-tree connection method is selected continuously for the re-assignment of the unroutable nets until the routing density is less than or equal to the channel capacity; finally the channel routing is accomplished by using the weighted left-edge algorithm and several heuristic methods are used to eliminate the multi-occupation of polysilicon. (Paper received 26 December 1984).

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A COMPUTER SIMULATION OF INDUCED-DIFFUSION BY PULSED LASER

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 620-626

[English abstract of article by Liu Kun [0491 3540] and Xie Zongjun [6200 1350 6874], et al., of the Institute of Semiconductors, Chinese Academy of Sciences]

[Text] The thermal conduction equation and the impurity diffusion equation in the induced-diffusion process by pulsed laser have been solved using the difference equation method set in a computer. The temperature distribution in different layers of a silicon wafer, the change of temperature with time and the impurity diffusion distribution are obtained. In order to attain efficient impurity diffusion results, the power density of the laser must be greater than a certain value so that the silicon layer is melted to some depth and liquid phase diffusion occurs. The main parameters affecting the impurity diffusion are the power density of the pulsed laser and the duration of the pulse because these two parameters determine the depty of the melted layer of silicon and the time of keeping the liquid state. For other lasers with different wavelengths, the absorption coefficient and reflectivity of silicon are different so that the results of impurity diffusion are different. The computer simulation results are in good agreement with those of measurements for boron induced diffusion in silicon by pulsed dye-laser. A short discussion of the simulation results is given. (Paper received on 14 December 1984.)

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LONG WAVELENGTH OPTICAL PHONON SPECTRA OF $Ga_{1-x}Al_xAs$ AND $GaAs_{1-x}P_x$ MIXED CRYSTALS

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 634-640

[English abstract of article by Wang Zhaoping [3076 0340 1627], Zhao Xueshu [6392 1331 1859] and Li Guohua [2621 0948 5478], et al., of the Institute of Semiconductors, Chinese Academy of Sciences]

[Text] The Raman spectra of $Ga_{1-x}Al_xAs$ and $GaAs_{1-x}P_x$ mixed crystal systems have been measured. The typical "two mode" behavior is confirmed in these systems. The dependence of the long wavelength optical phonon frequencies on the composition of the mixed crystals is obtained from the measured Raman spectra. A simplified model based on the MREI model is presented in which the authors take into account only the first neighbor interaction and polarization field and assume the different linear variations of the first neighbor force constants with the composition. The dependence of the long wavelength optical phonon frequencies on the composition of mixed crystal is calculated without any adjustable parameters. The calculated results are in good agreement with the experimental data. (Paper received on 22 December 1984.)

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CW Ar^+-LASER ANNEALING CHARACTERISTICS OF HIGH-DOSE As^+- AND Sb^+-IMPLANTED SILICON

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 641-647

[English abstract of article by Qian Peixin [6929 0160 0207] and Lin Huiwang [2651 1920 2489], et al., of the Institute of Microelectronics, Qinghua University]

[Text] The annealing behavior of the high-dose arsenic implanted silicon (double energy implantation: 150 keV, 1.05 x 10^{16} cm^{-2} and 60 keV, 3.5 x 10^{15} cm^{-2}) using CW Ar^+-laser irradiation is investigated. The annealing characteristics depend on the substrate preheating temperature and laser power. The experimental results show that a higher electrical activation can be obtained under a suitable substrate preheating temperature and laser power. Over the preheating temperature the electrical activation is reduced due to the relaxation of the metastable concentration, while under the preheating temperature serious damage to the wafer, even fine cracks, can be produced due to the higher laser power. In high-dose antimony implanted silicon (150 keV, 10^{16} cm^{-2}) the same phenomena are found. (Paper received on 28 December 1984.)

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LIQUID PHASE LASER CRYSTALLIZATION OF HYDROGENATED AMORPHOUS SILICON

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 655-657

[English abstract of article by Bao Ximao [7637 1585 5399] and Yang Min [2799 2404] of Nanjing University]

[Text] Hydrogenated amorphous silicon was crystallized with a CW Ar laser at low scan speeds. By properly controlling the scan speeds, laser power and energy profile in the laser spot, a liquid phase crystallization was achieved. The grain size of the crystallized polysilicon is about 20-30 μm. Using overlap laser scanning, large area polysilicon film with large grain size can be obtained. It is possible to provide a crystallized film for device fabrication. (Paper received on 14 March 1985.)

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LARGE OPTICAL CAVITY SECTIONAL CONSTRICTED-PLANAR COMPOSITE CAVITY DH LASERS

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 6 No 6, Nov 85 pp 661-663

[English abstract of article by Du Guotong [2629 0948 0681] and Gao Dingsan [7559 7844 0005] of the Department of Electronic Science, Jilin University; and Yang Delin [2799 1795 2651] of Chongqing Institute of Optoelectronics]

[Text] The large optical cavity sectional constricted-planar composite cavity DH lasers (LOC-SCP), which consist of an index-guided CDH-LOC section and a gain-guided OS-LOC section, have been designed and fabricated. At present the room temperature (27°C) CW threshold current as as low as 54 mA, stable fundamental lateral operation has been achieved with output power over 30 mW and external quantum efficiency of 55 percent, for a total cavity length of 135 μm, horizontal beam divergence angle of about 8° and vertical angle of about 40°. (Paper received on 22 June 1985.)

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